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EDITORIAL

SERUM PROTEINS

This subject was discussed recently at the Royal Society of Medicine, London, and a series of interesting papers have been published.[1]

The exposure of serum proteins to the influence of an electric field under certain specific conditions causes the proteins to fractionate into groups which migrate towards one of the electrodes at different velocities. By the use of paper electrophoresis analysis of the proteins can be performed even in small laboratories, and a large literature is already available on this subject. Using a standardized technique Flynn[1] finds that adequate information can be obtained by simple visual assessment of the paper strip; and the form of the protein spectrum may yield information of special diagnostic significance; though in most cases the electrophoretic pattern shows only non-specific changes. In certain conditions the routine investigation by this method is of value, e.g. in obscure anaemias. He states in summary that as regards the changes in electrophoretic globulin fractions the alpha globulins are increased in high fever, tissue destruction and the nephrotic syndrome; the beta globulin in conditions in which the serum phospholipids and cholesterol are increased, and in some cases of myeloma; the gamma globulin in chronic infections, liver disease, collagen diseases, and in some cases of myeloma.

In a report on the changes in the serum and urinary protein which are found in the nephrotic syndrome Hardwicke[1] shows that in the serum the albumin is low and the α_2 globulin at a high level; and that the urine contains variable proportions of albumin and the various globulin fractions in different patients, the high-molecular α_2 globulin being virtually absent. He finds that the serum lipid is also much increased, but the urine is strikingly free from lipid. The author shows graphically the alterations in concentration of the globulin components of the plasma as the albumin level falls, and the relationship between serum albumin and the daily urinary protein loss.

In another paper Frazer[1] briefly reviews the present knowledge of the lipoproteins of human blood. These substances have been thought to play some part in the transport of lipids. Recent studies suggest that the levels

VAN DIE REDAKSIE

SERUM-PROTEÏENE

Hierdie onderwerp was onlangs by die *Royal Society of Medicine* in Londen bespreek, en 'n reeks interessante artikels is gepubliseer.

As serum-proteïene onder sekere spesifieke toestande aan 'n elektriese veld blootgestel word, breek die proteïene in groepe op wat teen verskillende snelhede na een van die elektrodes beweeg. Deur middel van papier-elektroforese kan die proteïene selfs in klein laboratoriums ontleed word en daar is baie literatuur oor hierdie onderwerp beskikbaar. Flynn[1] het 'n standaardtegniek gebruik en gevind dat voldoende inligting verkry kon word deur doodeenvoudig die papierstrook met die blote oog te bestudeer; uit die vorm van die proteïenspektrum mag inligting verkry word wat diagnosties van groot belang is, in die meeste gevalle dui die elektroforesepatroon egter net veranderings van 'n nie-spesifieke aard aan. In sekere gevalle is die roetine-ondersoek deur hierdie metode van nut, bv. met verborge bloedarmoede. Met betrekking tot veranderings in die elektroforetiese globuliendele verklaar hy opsommend dat alpha-globulien vermeerder wanneer weefsels tydens 'n hoë koors en die nefrotiese sindroom vernietig word; beta-globulien wanneer die serum-fosfolipiede en die cholesterol toeneem en ook in sommige gevalle van miëloom; die gamma-globulien in kroniese infeksies, lewerkwale, kollageensiektes en in sommige gevalle van miëloom.

In sy verslag oor die veranderings in serum- en urienproteïen wat by die nefrotiese sindroom te voorskyn kom, wys Hardwicke[1] daarop dat die albumien in die serum laag is en die α_2 globulien hoog; dat die verhouding van die albumien en die verskeie globuliendele in die urien van pasiënt tot pasiënt wissel en dat feitlik geen hoë molekulêre α_2 globulien aanwesig is nie. Hy vind ook dat die serumlipied baie toeneem maar dat die urien besonder lipied-vry is. Die skrywer verduidelik met grafieke hoe die konsentrasies globuliendeel in die plasma verander na gelang die albumien sak, ook toon hy die verwantskap aan tussen die serum-albumien en die daaglikse verlies van urienproteïen.

Frazer[1] gee 'n kort oorsig van die huidige kennis van die lipoproteïene in mensbloed. Die mening was dat hierdie stowwe 'n rol in die vervoer van die lipiede speel. Onlangse studies suggereer dat die bloedhoogtes 'n aanduiding is van die mate waartoe hul deur die lewer

in the blood reflect the degree of their production and utilization in the liver. The author considers that changes in the blood lipoproteins can be significantly correlated with atherogenesis, and that certain tissue changes may prove to be reversible. The precise significance of changes in the lipoprotein pattern in the blood has still to be elucidated. Most interesting information on the variations in lipoprotein under different conditions is concerned with the amounts of different-sized particles found on ultracentrifugation.

Martin [1] reports some experiences with the transfusion of human albumin and balance studies in patients with chronic liver damage. It was found that after intravenous injection in health and disease relatively rapid passage of albumin may take place through the body compartments and perhaps to the cells themselves. Another point stressed by this author is the ability of albumin as a highly charged ampholyte to interact with small molecules, thus making albumin important in the control of the disposal of small molecules.

Some rare protein disorders have lately been described, as for example agammaglobulinaemia, in which there is complete absence of gamma-globulin; and macroglobulinaemia, in which there is a very dense band in the gamma-globulin, a high percentage of protein in the serum being of high molecular weight.

1. Proc. Roy. Soc. Med. (1954): **47,** 827-838.

vervaardig en gebruik word. Die skrywer is van mening dat verandering in bloedlipoproteïene met die ontstaan van slagaarvervetting gekorreleer kan word en dat sekere weefselveranderings moontlik herroepbaar is. Die juiste betekenis van veranderings in die bloed lipoproteïenpatroon wag nog op verduideliking. Besonder interessante inligting oor variasies in die lipoproteïene onder verskillende omstandighede is betrokke by die hoeveelhede deeltjies, verskillend in grootte, wat met uitermate sentrifugering gevind word.

Martin [1] gee 'n verslag oor ondervindings i.v.m. die oortap van mens-albumien en balansstudies in pasiënte wat aan kroniese lewerbeskadiging ly. Nadat gesonde of siek persone binneaars ingespuit was, was bevind dat die albumien betreklik vinnig deur die liggaam se kompartemente trek, moontlik tot in die selle self. Die skrywer beklemtoon ook die punt dat albumien (as 'n hooggelaaide amfoliet) en die klein molekules op mekaar reageer en dat albumien derhalwe invloed uitoefen op die reëling van klein molekules.

Onlangs is seldsame proteïen-ongesteldhede beskrywe soos bv. agammaglobulieneem, wanneer die gammaglobulien geheel en al afwesig is; makroglobulieneem, wanneer die gamma-globulien 'n baie digte band het, en 'n hoë persentasie serum-proteïen 'n hoë molekulêre gewig besit.

1. Proc. Roy. Soc. Med. (1954): **47,** 827-838.

BLOOD GROUPS AND THE CLINICIAN

Children, it has been said, should choose their parents with care. Everyone knows that the Rh groups of parents are of importance; but until quite recently it seemed to matter little to anyone whether he belonged to Group A, B, AB or O unless he had just received an incompatible transfusion. Haemolytic disease of the newborn, it is true, may be due to ABO incompatibility, but this is rare. In 1950 the authors of a standard work [1] could still observe that, maternal-foetal differences apart, there was no evidence that those of any given blood group were particularly susceptible to any disease. They added that some differences in susceptibility would surely be found. This would be expected on theoretical grounds, since a balanced polymorphism of the kind exemplified by the blood groups needs such selective advantages if it is to be maintained.

Several recent papers have suggested some of the possible advantages and limitations of belonging to particular ABO groups. Aird and his colleagues [2] showed in 1953 that subjects of group A seemed to be significantly more liable to carcinoma of the stomach than those of group O. But the tribulations of the O subjects are not confined to blood-giving, and in the following year Aird's team [3] showed that bearers of group O were apparently very appreciably more prone to peptic ulcer than those of other groups. Pike and Dickens [4] brought forward evidence to suggest that this was also true of toxaemia of pregnancy. Aird *et al.*[3] found no relation between the ABO groups and the incidence of carcinoma of the colon, rectum, bronchus and breast.

Further work will clearly be necessary. Statistical investigations of the kind needed are full of pitfalls, but there seems no doubt that real differences in disease incidence between those of different blood groups have been demonstrated, and that more will be found. From the genetic point of view, the mechanisms of selective advantage and disadvantage are still obscure. Carcinoma of the stomach, for example, usually attacks those who are at or near the end of reproductive life, so that its effect on the A frequency of coming generations must be very small. Probably it is only one of many factors which act in this way. Human population genetics is a most complicated subject, and one of which we know little. The blood-group studies now being undertaken are of obvious clinical interest; but they promise also to contribute something, however indirectly, to our understanding of the mechanism of human evolution.

1. Race, R. R. and Sanger, R. (1950): *Blood Groups in Man,* 1st ed., p. 241. Oxford: Blackwell Scientific Publications.
2. Aird, I., Bentall, H. H. and Roberts, J. A. F. (1953): Brit. Med. J., **1,** 799.
3. Aird, I., Bentall, H. H., Mehigan, J. A. and Roberts, J. A. F. (1954): *Ibid.*, **2,** 315.
4. Pike, L. A. and Dickens, A. M. (1954): *Ibid.*, **2,** 321.

ACUTE CAUSTIC SODA INJURIES OF THE OESOPHAGUS*

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The widespread domestic use of caustic soda, and the consequent exposure of large sections of the community to the corrosive, has created a distressing sociological problem. This was recognised by Chevalier Jackson (1921) who believed that adequate labelling of all containers of lye would materially lessen the dangers. In 1927 this was made compulsory in the United States, but according to Brown and Kiser (1942) the incidence of poisoning with caustics has continued to increase in that country.

The startling frequency of injuries in Johannesburg, a city of approximately 800,000 people, has formed the subject of a recent communication (Marchand 1954), in which the sociological aspects of the problem as seen in the Union were presented. The cases discussed were admitted to 4 hospitals in Johannesburg between July 1948 and July 1952 and came under the care of the Thoracic Surgery Unit directed by Mr. L. Fatti. During the following year a further 36 cases were treated, making a total of 152 cases in 5 years (Table I). Fifty-five of these patients were admitted with established oesophageal strictures and 97 were seen within a week of sustaining injury.

TABLE I. CASES TREATED BY THE THORACIC UNIT OVER A PERIOD OF 5 YEARS, BY RACE, SEX AND AGE (INCLUDING CASES ADMITTED WITH ESTABLISHED OESOPHAGEAL STRICTURES)

	Adults		*Children*	*Total*
	Male	*Female*	(*under* 14)	
European	7	12	8	27
Coloured	9	31	13	53
Indian	3	11 *	6	20
African	12	10	30	52
Total	31	64	57	152

* 1 Chinese.

The present communication deals with the clinical and therapeutic problems which we have experienced during the management of the 97 cases of acute caustic soda poisoning. All the cases were investigated according to principles formulated within the Unit and the eventual fate of every patient is known. A year has passed since the last case in the series was admitted to hospital.

CLINICAL COURSE

For purposes of description the clinical course may be divided into 3 stages, viz. (*a*) the acute stage, (*b*) a latent period, and (*c*) the stage of organic stricture.

The Acute Stage. Dr. Emma Kohman-Ivy, a physiologist, accidentally swallowed 4 c.c. of a boiling caustic solution and has given a graphic account of her experience (Ivy 1922). Pain was immediate and severe, within 5 minutes she was unable to swallow, and after 20 minutes respiration was difficult. A sequence like this is usual, though patients are seldom able to describe them so concisely.

The duration of the acute symptoms varies with the severity of injury. The pain usually gradually diminishes over the course of 3 or 4 days, the vomiting ceases somewhat sooner, but the acute dyspnoea generally lasts only a few hours.

The Latent Period. By the 5th day all but the most severely injured patients are comparatively free from pain, are able to swallow fluids, and are buoyantly confident that the worst is over.

Patients with moderate injuries are usually able to take semi-solids by the end of the 1st week, whilst those with minor damage may have little obviously wrong after 2 or 3 days. With severe oesophageal injury temporary alleviation of dysphagia may never be experienced, whilst with moderate injury there is only occasionally a latent period of complete normality between the acute dysphagia and dysphagia due to organic stricture.

In this series only 4 of the 41 patients who developed circumferential strictures experienced an interval when they were able to swallow solids without any difficulty whatever.

The Stage of Organic Stricture. The time of onset and the degree of dysphagia depends upon the site and the rapidity of development of the stricture. In instances of severe oesophageal injury the primary dysphagia, due essentially to the pain of the corrosion, passes imperceptibly into the mechanical dysphagia due to the stricture. It is only with minor injuries that strictures may form so insidiously that the force of swallowing adapts itself to the gradually increasing resistance. In these instances months may pass before the victims become aware of swallowing difficulties.

SIGNIFICANCE OF SIGNS AND SYMPTOMS

The question constantly in the mind of the medical attendant is whether or not the oesophagus has been corroded. In this series of 97 injuries, 51 patients (53%) escaped without developing significant strictures. Many of these, when first seen, appeared on superficial examination to be critically injured, whilst others, who later developed pronounced strictures, seemed little affected during the early stages. This is not surprising when one considers the different types of people involved. The hysterical suicide, who has little more than brushed her lips with the caustic, may be in great distress, whilst the stoic or the unimaginative may show little emotional upset.

The author has taken especial cognizance of the signs and symptoms during the early stages in the hope that they might assist in the diagnosis of oesophageal involvement.

Shock. When first admitted it is not uncommon for the victim to be in a state of shock but, once supportive

* This paper was written whilst the author was a Nuffield Dominion Fellow at Guy's Hospital, London, and the costs of production were met by the Nuffield Foundation.

emergency measures are instituted, recovery is usually rapid. Five patients remained in profound shock for more than 12 hours; 3 of them died and 2 developed very tight oesophageal strictures.

Visible Burns. It was once thought that the site and severity of visible burns would give a reliable indication of oesophageal damage. A severely corroded mouth is intensely reddened, with areas of desquamation and sites where the epithelium is opaque and coagulated. The lips, palate, uvula and fauces may rapidly become oedematous and the tongue may be so swollen that it protrudes from the mouth. Immediately after injury only a limited area may be involved, yet at a later examination the whole surface of the mouth may be found to be affected by the local extension of the corrosive action.

Amongst the 51 patients who did not develop oesophageal strictures, only 4 had no visible areas of corrosion beyond diffuse erythema of the lips and mouth. The others presented with injuries more or less comparable with those of the patients who later developed strictures (Figs. 1 and 2). All those who had taken solid caustic soda sustained severe oral burns, yet none developed serious oesophageal strictures.

Pharyngeal burns are of greater significance, but their absence in no way excludes the possibility of oesophageal corrosion.

Our experience is wholly in variance with Crowe's view (1944) that oral burns may be considered presumptive evidence of oesophageal injury.

Pain. The victims suffer appalling agonies during the first few hours but the intense pain rapidly dulls as the sensory nerve-endings in the mouth and pharynx are destroyed. When massive amounts have been taken this remission is temporary, for extension of the corrosive action beyond the confines of the alimentary tract may cause severe pain to recur. The suffering of patients who develop mediastinitis, peritonitis and pleurisy is only alleviated by profound narcosis. With the majority of cases, however, the significance of pain is difficult to assess because of the wide variation in the reactions of the different types of individuals.

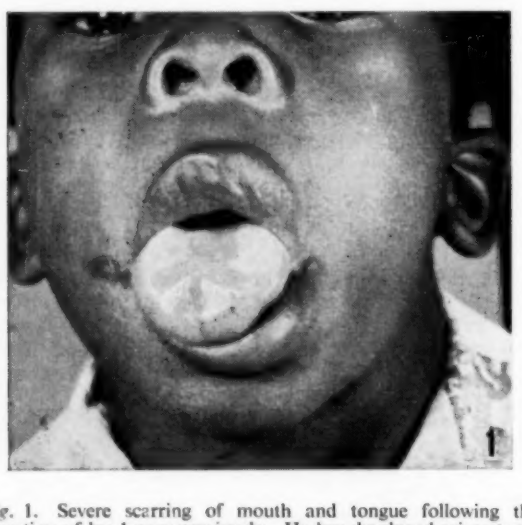

Fig. 1. Severe scarring of mouth and tongue following the ingestion of lye 1 year previously. He has developed microstoma and ankyloglossia. The oesophagus is unaffected (Fig. 2).

Burning pain of the mouth and throat, localized particularly to the angles of the jaw, often persists for days and hinders swallowing. Earache is frequent and is probably due to oedema of the Eustachian orifices. On 2 occasions middle-ear suppuration has occurred. Pleuritic pains are secondary to inflammatory changes within the lung resulting from inhalation of caustic at the time of injury or of vomitus or food during the days which follow.

Localization of oesophageal pain, particularly when arising from the upper third, is moderately accurate. Most patients complain of burning in the throat for several days and a diffuse burning substernal pain is common. Cervical and substernal pain does not necessarily imply that the oesophagus is severely corroded. Early oesophagoscopic examinations have repeatedly failed to establish such a correlation and on many occasions, though the patient had complained bitterly of discomfort, the oesophagus was found to be unaffected apart from erythema.

Abdominal pain is a frequent symptom. There are 2 common sites of pain: the region of the xiphisternum and an area to the right of the mid-line beneath the tip of the 9th costal cartilage. No precise correlation has been found between the mid-line epigastric pain and corrosion of the distal oesophagus. Right epigastric pain is probably secondary to pyloric irritation and 3 patients who complained of severe persistent pain in this region subsequently developed pyloric stenosis.

Pain is not a reliable index of corrosion of sufficient degree to cause strictures. Apart from the wide variations in the reactions of different people to a similar pain-producing stimulus, it has been our experience that pain may be slight when damage is considerable and may be severe in the absence of significant organic injury.

Vomiting. Whether the trauma be mild or severe, it is usual for patients to vomit shortly after swallowing lye. At first, the vomitus is intensely alkaline and altered blood is present in all but the mildest cases. Shreds of denuded mucosa are usually present, and on 2 occasions casts of considerable segments of the oesophagus were vomited towards the end of the 1st week (Fig. 3). Shreds of tissue, when examined microscopically, are found to consist entirely of epithelium but casts usually include other layers. Witthaus (1911) described an oesophageal cast composed of mucosa, submucosa and part of the muscular coat of the entire organ, including the lower pharynx and epiglottis.

Mucosal shreds denote severe penetrating injury but they do not necessarily derive from the oesophagus. Extensive areas of the epithelium of the tongue, palate and cheeks may exfoliate in the absence of oesophageal involvement. Casts of the oesophagus are easily recognized and indicate that a stricture is inevitable.

Anaemia. Eight patients became markedly anaemic within 10 days of injury. All had severe oesophageal corrosion.

Routine serial blood counts have been performed on 52 patients and a progressive decrease of the haemoglobin level has usually accompanied extensive injuries. Caustic

Fig. 2. Barium swallow of child shown in Fig. 1. There is no evidence of stricture 1 year after swallowing the lye.
Fig. 3. Oesophageal cast 15 cm. long vomited 4 days after the ingestion of lye.
Fig. 4. Lipiodol swallow 48 hours after injury. The contrast medium has entered the larynx and trachea.

soda has no direct haemolytic action and it would seem that serial haemoglobin estimations provide an indirect index of the extent of injury.

Acute Dysphagia. The dysphagia which follows immediately after corrosive injury is essentially a difficulty in initiating the swallowing reflex. Dr. Ivy experienced dysphagia 5 minutes after the accident and this persisted for 5 days. She localized the difficulty to the back of her throat and not to the oesophageal obstruction which she was to experience later. Carlson (1922) believes that the dysphagia is due to destruction or paralysis of the glosso-pharyngeal nerve-endings in the pharynx. These, he maintains, are the receptors of the stimuli which initiate the reflex stage of deglutition and if they are destroyed the co-ordination necessary for normal swallowing is lost.

Dysphagia may, however, be experienced in the absence of penetrating pharyngeal injury and here it would appear that the pain caused by attempts at swallowing is responsible. This view is suggested by the fact that an efficient surface anaesthetic will often enable these patients to swallow with greater freedom.

In cases of severe oesophageal corrosion, the direct action of the caustic on the oesophagus may contribute to the dysphagia.

Dysphagia due solely to oral pain and oedema is never complete and lasts from 3 to 5 days. When difficulty persists for longer periods the pharynx or the oesophagus (or both) are always involved. The reverse does not hold true, and on rare occasions a stricture has developed after a period of normal swallowing ability.

Other Disturbances of Deglutition. Attacks of coughing on swallowing may be so constant that a tracheo-oesophageal fistula is suspected. This we have never found and in 12 patients who experienced this distressing symptom it was possible to demonstrate, by lipiodol swallow, that the contrast medium entered the trachea *via* the larynx. There were 5 cases of death during the acute stages, in 2 of which it was possible to demonstrate such a spill-over radiologically. At necropsy the larynx, trachea and bronchi, in addition to the pharynx and oesophagus, were severely corroded. In the 10 other cases with such radiological findings, laryngoscopy and bronchoscopy confirmed that the rima glottidis and larynx, and occasionally the trachea, were involved. The paroxysms of coughing are therefore probably caused by incoordination of the swallowing reflex secondary to anaesthesia of the corroded pharynx and larynx.

Nasal regurgitation during swallowing occurred in 6 cases. These patients had extensive oral and pharyngeal burns with intense oedema of the soft palate and uvula. Two patients have persistent disability due to palatal scarring and both have the impaired phonation typical of a palatal defect.

Laryngeal and Respiratory Symptoms. The distressing sense of suffocation which may follow the ingestion of caustic soda is probably a result of laryngeal spasm due to irritation of the larynx. Such spasm prevents the entry of caustic into the air-passages but the inevitable relaxation with that sudden relieving in-rush of air may allow lethal quantities of caustic to enter the lungs. The 3 patients who died within 48 hours had extensive corrosive injuries of trachea and bronchi and advanced pulmonary oedema.

Respiratory complications due to other causes are frequent. When the laryngeal inlet is corroded and insensitive, inhalation of food and vomitus is a grave danger and broncho-pneumonia and atelectases may result.

Hoarseness, when present, signifies laryngeal involvement and one unfortunate girl has a permanently husky voice due to scarring of the vocal cords.

Hoarseness and respiratory complications indicate that the pharynx and probably the oesophagus have been involved, but give no clue as to the presence of the crucial factor of ulceration.

DIAGNOSIS OF OESOPHAGEAL CORROSION

It is a fundamental requisite that involvement of the oesophagus should be proved before treatment is instituted. Only if this is established with exact certainty is it possible to assess the efficacy of the various methods of treatment. No reliance can be placed on the severity of oral injury and indeed no constant sign or symptom is pathognomonic of oesophageal corrosion of a degree sufficient to cause a stricture. There are, of course, cases where the true position is never in doubt, but in a large number one must rely on specialized investigations before a final decision can be made. Every survivor in this series was subjected to routine radioscopic and endoscopic examinations.

Radioscopy

Examinations by means of barium or lipiodol swallow are preferably performed within 48 hours of admission to hospital. When indicated, they were repeated at weekly intervals. The patients first swallow 5 c.c. of lipiodol whilst in the erect position. Should this be observed to enter the larynx, the examination is abandoned, with the certain knowledge that the lower pharynx, and probably the oesophagus, has been involved. On the other hand, if lipiodol passes into the oesophagus, 4 oz. (110 ml.) of a thin barium emulsion are given to the patient in the erect and supine positions. Considerable patience and sympathy may be required before this can be accomplished.

During the examination, the following points are noted: (*a*) the height of the barium column at the end of the swallow in the erect position; (*b*) the presence or absence of secondary and tertiary contraction waves, and (*c*) the rapidity of emptying of the oesophagus.

The observations have been of great interest but the method has not proved a reliable means of assessing oesophageal corrosion. In instances of severe injury several distinctive patterns of appearance have been produced:

(*a*) The contrast medium may enter the trachea (Fig. 4). This only proves that the laryngeal inlet has been injured but is of importance as a warning of the dangers of inhalation of food and secretions.

(*b*) Atonic oesophagus. In 6 instances the barium-filled oesophagus was widely dilated and no peristaltic activity was seen over a prolonged period of observation. In the erect position barium would accumulate in the inert oesophagus until a column sufficient to overcome the pleuro-peritoneal pressure gradient was reached. In the supine position the contrast medium remained indefinitely as a continuous column from mouth to cardia (Fig. 5). Serial observations showed that the atony persisted until stricturing began to distort the organ. In every case severe strictures resulted.

(*c*) The narrow rigid oesophagus. Seven patients, all of whom developed extensive tubular strictures, showed this appearance shortly after injury. In these cases the outline of the narrowed oesophagus was constantly irregular, and no peristaltic activity was evoked by attempts at swallowing (Fig. 6). These appearances are probably caused by oedema of the oesophageal walls and the fixed irregularities correspond with areas of mucosal ulceration.

(*d*) The irritable oesophagus. On 10 occasions irregular contractions of the lower oesophagus have been observed (Fig. 7). Three of these cases developed moderate strictures, 4 developed mild areas of localized fibrosis and 3 escaped without evidence of strictures. It is probable that tertiary contractions are an expression of oesophageal irritation due to superficial corrosive injury.

Fig. 5. Atonic oesophagus 60 hours after the ingestion of lye. The whole oesophagus subsequently stenosed.
Fig. 6. Narrowed and rigid oesophagus 30 hours after injury. An extreme stricture subsequently formed.
Fig. 7. Tertiary peristaltic contractions seen in a case with mild corrosive injuries of the oesophagus.

Oesophagoscopy

On the basis of our experiences it is felt that the only precise means of determining oesophageal involvement is to inspect the organ directly. This procedure has been critized because theoretically it is dangerous and because it is a specialized method of investigation which comparatively few physicians are qualified to use. In experienced hands immediate oesophagoscopy carries very little danger provided one is content to prove the existence and not the extent of damage. As for the second criticism, no one should presume to treat the acute caustic victim unless able to pass an oesophagoscope with gentleness and skill.

Unless oesophagoscopy is used as a routine method of investigation, the assessment of oesophageal corrosion remains presumptive. A great deal has been written about the treatment of acute caustic burns of the oesophagus and extravagant claims have been made about the value to the methods used, yet few of the authors have based their diagnoses upon direct inspection. Occasional workers (Blassingame *et al.*, 1947, Kernodle *et al.*, 1948, and Leegaard, 1945) have used oesophagoscopy during the acute stages but not as an indispensable need for correct diagnosis.

In this series oesophagoscopy has been performed on every patient admitted with a diagnosis of acute caustic poisoning, with the exception of 3 patients who were profoundly shocked and who died within 48 hours of admission to hospital. These examinations were made as soon as it was considered safe to administer a general anaesthetic. As a rule this was possible within 2-6 days of injury.

Ninety-four patients have been examined within a week of injury. Whenever oesophageal corrosion has been confirmed, the examination has been repeated at weekly intervals until healing has occurred or until

definitive treatment has been decided upon. At the first examination it is a rigid rule that inspection be confined to the detection of corrosion and no attempts made to advance beyond an area of mucosal ulceration. Even if the pharynx is severely involved it is possible to introduce the instrument into the oesophagus without danger. There has been no instance of untoward effect attributable to the examination.

The nature of the eventual stricture depends on 3 factors: (*a*) the depth of corrosion, (*b*) the circumferential extent of injury, and (*c*) the longitudinal extent of injury.

The Depth of Corrosion. Simple erythema of the oesophageal mucosa can be disregarded and the instrument may safely be advanced beyond an area with this appearance. If no ulceration is found, the oesophagoscope must be passed into the stomach before the gullet can be pronounced clear.

The appearances of oesophageal corrosion are the same as those of the mouth. Epithelium that is intact and viable is intensely reddened, but when destroyed it is swollen, opaque and grey in colour. By the 4th-7th day, when most of these examinations were done, the coagulated mucosa has desquamated, leaving dark red ulcers which bleed very readily. An oesophagus with coagulated epithelium, areas of ulceration, and granulations, is deeply involved and must inevitably heal by fibrosis.

The Circumferential Extent. Scarring is the sequel of mucosal ulceration but this may not be sufficient to cause a stricture. Ulceration confined to less than the total circumference is unlikely to produce significant narrowing, though localized shelves and luminal distortion may result. When the whole circumference is deeply ulcerated a stricture is inevitable.

The Longitudinal Extent. This is a factor of the utmost importance and one which it may be impossible to confirm by oesophagoscopy if the bounds of safety are not to be transgressed. On the lineal extent of ulceration depends the issue whether an innocuous ring stricture or a refractory tubular one will develop. If the walls of the corroded oesophagus are oedematous and rigid, the lumen may be held open by the beak of the oesophagoscope so that several centimetres of epithelium are visible. This only occurs with severe extensive corrosion and carries an ominous prognosis for the future patency of the organ. The absence of rigidity does not justify the assumption that a tubular stricture will not develop.

A difficulty which frequently arises is to determine whether severe burns are present beyond an area of partial circumferential involvement. It has proved a general rule that a burn of the cervical oesophagus, whether partial or complete, is associated with more severe involvement beyond. In the individual case time alone can provide the certainty, but the association of a cervical ring stricture and a tubular thoracic one is so frequent that it is reasonable to presume severe distal corrosion whenever limited cervical injury is observed. The lower the level of initial ulceration, the less likely is severe oesophageal injury to be present.

Incidence of Oesophageal Involvement. Ninety-four patients were subjected to early oesophagoscopic examination and in 26 instances circumferential ulcerations were seen. Two of these patients died and 24 have developed extensive oesophageal fibrosis.

In 37 cases no ulceration whatever was found and none of the patients in this group have developed a stricture.

In 31 instances areas of partial circumferential corrosion were seen. In 8 of these only the lower third of the oesophagus was involved and all have escaped without significant oesophageal narrowing. Six showed areas of partial corrosion of the upper thoracic segment, 2 of whom have developed multiple localized shelf strictures and 4 are asymptomatic. On 17 occasions partial cervical ulceration was encountered and further inspection of the oesophagus was abandoned. Ten of these patients developed localized cervical shelves or strictures associated with severe tubular strictures of the lower oesophagus. Two are asymptomatic and 5 developed multiple localized strictures which were dilated without serious difficulty (Table II).

TABLE II. CORRELATION BETWEEN FINDINGS DURING THE EARLY OESOPHAGOSCOPIC EXAMINATIONS AND THE EVENTUAL OUTCOME

Oesophagoscopic Appearance	*Total No.*	*Deaths*	*Severe Strictures*	*Multiple Localized Strictures*	*Asymptomatic*
No Ulceration	37	—	—	—	37
Partial Circumferential Corrosion:					
Lower thoracic ..	8	—	—	—	8
Upper thoracic ..	6	—	—	2	4
Cervical	17	—	10	5	2
Severe Circumferential corrosion	26	2	24	—	—
Total ..	94	2	34	7	51

THE HEALING OF CORROSIVE LESIONS

The major damage is sustained at the moment of swallowing the corrosive. Caustic soda is rapidly bound to the destroyed tissues and within a few hours all corrosive activity has ceased.

The stages of healing correspond with those following thermal injuries. The inflammatory response around the devitalized tissue causes sloughs to separate and the resulting ulcers are the site of active growth of new capillaries and fibroblasts. When the defect has filled by granulation the cells of the surviving epithelium at the margins of the ulcers proliferate to cover the young vascular tissue. The growth of epithelium only proceeds satisfactorily in the absence of repetitive irritation and remains vulnerable until the epithelium has differentiated into stratified layers. When considerable segments of oesophagus have been denuded of mucosa regeneration may never be complete (Fig. 8).

Once the injured areas have been covered by epithelium the granulation tissue ceases to form and devascularization commences. Cicatrization begins within 10 days of injury but is a gradual process which varies with the extent of destruction.

When specialized structures are corroded there can be no regeneration except as scar. Muscle, mucous glands and nerve fibres never reappear within the destroyed areas.

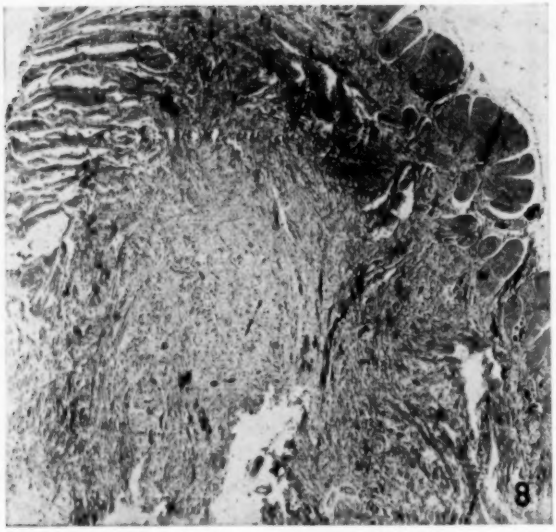

Fig. 8. Transverse section of a strictured oesophagus removed at operation 8 years after injury. The lumen, lined only by fibrous tissue, can be seen near the lower edge of the photograph. Magnification ×25.

Strictures are the end-result of repair and their severity is determined by (*a*) the extent and penetration of corrosion, and (*b*) the degree and duration of secondary infection and other factors which retard healing.

The Extent and Penetration of Corrosion. The greater the area of destruction, the longer it takes for the epithelium to regenerate and the greater the amount of granulation tissue that forms. When the gap is too great for the epithelium to bridge, extremely dense strictures result.

If the deep layers of the mucosa survive, healing will occur without fibrosis, but once the muscularis mucosa is destroyed scarring is inevitable. With severe injuries the whole depth of the oesophageal wall may be involved and even the extra-oesophageal tissue planes may be obliterated by fibrosis.

Bacterial Infection. Once the oesophagus has been severely traumatized, infection readily supervenes. Unless this is checked additional injury may be caused and healing delayed sufficiently to convert what may have been a mild stricture into one of great severity.

Other Traumatizing Factors. Apart from infection, the commonest cause of delayed healing is the early passage of a bougie. Regenerating epithelium is thin and delicate and when bougies are passed daily repeated injury is caused and fibrosis is correspondingly increased.

The Rate of Healing. Routine weekly examinations have provided the opportunity of observing the progress of corrosive lesions. It has been consistently noted that oral burns heal before oesophageal burns, and the lips sooner than the mouth or pharynx. In the oesophagus the lower injuries usually take longest to heal. The factors which may account for this orderly progression of healing from above downwards are:

(*a*) Exposure to air. Wallace (1949) has shown that thermal burns of the skin mend rapidly when exposed to freely circulating air. This probably accounts for the rapid improvement of corrosive injuries of the lips.

(*b*) The severity of the burn. When a bolus of food is swallowed, it traverses the pharynx and upper oesophagus with such great speed that contact with the mucosa is momentary. The force and rapidity of the primary contraction wave of swallowing is dissipated in the mid-oesophagus and further progression is effected much more slowly by secondary waves of peristalsis. The contact of caustic soda with the lower oesophagus may be still further prolonged if paralysis or spasm of the propulsive musculature is produced. These considerations adequately account for the frequent association of superficial cervical oesophageal corrosion with severe involvement of the lower oesophagus. With very concentrated solutions, however, even momentary contact will cause profund damage.

As a general rule, moderately severe burns of the cervical oesophagus have re-epithelialized by the end of the 2nd week and those of the lower oesophagus by the 3rd or 4th weeks. In such cases one can confidently expect to control the ensuing stricture by dilatation. When ulceration persists after the 6th week the patient will probably develop a long dense stricture, difficult to treat and dangerous to dilate.

TREATMENT OF ACUTE CORROSIVE BURNS

Treatment should aim at (*a*) diluting and neutralizing the corrosive, (*b*) combating shock, (*c*) preventing pulmonary complications, (*d*) maintaining hydration and nutrition, (*e*) alleviating symptoms, (*f*) preventing infection, and (*g*) preventing stricture-formation.

Dilution and Neutralization. This has usually been carried out by relatives or friends long before a doctor is able to attend the victim. Milk is the favourite antidote but lemon-juice, olive oil and vinegar are also popular. If neutralizing agents are to be of use they must be given immediately. Concentrated acids and stomach wash-outs with large gastric tubes are dangerous forms of treatment.

Treatment of Shock. Emergency treatment is limited to the administration of morphia to allay pain and anxiety. In hospital it is the rule to give appropriate doses of morphine at 6-hourly intervals during the first 24 hours. General supportive treatment and if necessary intravenous infusions of blood, plasma or saline may be necessary. Very little else can be done during the first disturbing day.

Prevention and Treatment of Pulmonary Complications. The early deaths from ingestion of caustic soda are usually due to pulmonary complications. Nothing will prevent a fatal termination from pulmonary oedema when the bronchial tree has been flooded with concentrated corrosive, but breathing exercises and frequent postural changes will benefit the milder cases.

When the rima glottidis has been corroded there is grave danger of inhalation of food and vomitus. Formerly, when this occurred, oral feeding was withheld

for 4 or 5 days and hydration was maintained parenterally. We now believe that with conscious patients the danger is slight because the cough-reflex is capable of expelling intruding foreign material. Meals may be prolonged and punctuated by paroxysms of coughing, but this rapidly improves. The danger period is during sleep, particularly if induced by drugs, when the sensitivity of the laryngeal and tracheal mucosa is depressed. Whenever this danger exists the patient should sleep with the foot of the bed raised 18 inches and antibiotics should be administered prophylactically. Deep breathing exercises, effective coughing and postural drainage must be supervised at frequent intervals. Should atelectasis occur, bronchoscopic aspiration may be necessary.

Symptomatic Treatment. Pain is the main complaint during the early stages but if possible morphia should be avoided after the 1st day because of the dangers of pulmonary complications. Surface anaesthetics are useful when ulceration is slight, and dramatic improvement of pain and dysphagia may follow their use.

Frequent mouthwashes are in routine use and the teeth, gums and lips should be swabbed daily.

Prevention of Infection. From the long-term point of view, control of secondary infection is of cardinal importance. Chemotherapy has enormously improved the outlook and today 7 times as many people survive the effects of caustic injury as did so 50 years ago (Table 3). Control of infection is so important that there should be no hesitation in ordering several different antibiotics simultaneously.

TABLE III. MORTALITY COMPARED WITH THAT OF THE PRE-ANTIBIOTIC ERA

Series	*No. of Cases of Acute Poisoning*	*Deaths in Acute Stages*	
		No.	*%*
V. Hacker (1899)	333	112	35
Witthaus (1911)	83	30	36
Thoracic Surgery Unit, Johannesburg (1952)	97	5	5

Maintenance of Hydration and Nutrition. Maintenance of adequate nutrition may prove difficult during the first few weeks. Pain and oedema of the mouth and pharynx, paralysis, spasm and oedema of the oesophagus, and the tendency to inhale food and secretions, may make swallowing a difficult task. Frequently patients spit out copious quantities of saliva rather than suffer the discomfort of swallowing. Explanation and persuasion usually suffice to tide them over the first days but occasionally it is necessary to administer fluids rectally or by intravenous drip. After 48 hours the lessening of pain and oedema permits of progressively easier swallowing, and only in the most severe instances is there reason to consider gastrostomy. It is seldom necessary to continue with intravenous therapy after 2 or 3 days, but if so it is preferable to do a gastrostomy. We have twice had to have recourse to surgical measures within the first week; both patients were so frightfully injured that they eventually died.

PREVENTION OF STRICTURES

The Salzer Regime

In 1920 Salzer described a method of auto-dilatation with mercury-weighted bougies commencing within 2-6 days of injury. This work was publicized by Bokay (1924), who reported that 117 out of 132 patients treated by the method did not develop dysphagia. Gellis and Holt (1942) claimed that, of 41 children treated, only one developed a stricture. Kernodle, Taylor and Davison (1948) used the method on 21 patients of whom 5 developed strictures. Crowe (1944) reports that all 9 children in his series were free from strictures 6 months to 4 years after the accident. These results sounded impressive and we approached our first few attempts at Salzer's technique with enthusiasm.

The treatment requires the victim to swallow soft rubber bougies weighted with lead (Bokay) or mercury (Hurst), the object being to prevent the development of stricture rather than to effect dilatation. The first attempt is preferably made within 48 hours and the bougie must be completely swallowed before the 6th day has passed. A number-14 bougie is first swallowed and is retained in position for 5 minutes. The size is rapidly increased until, by the 6th day, a size-34 bougie is passed. This procedure is repeated twice daily for 2 weeks, after which the same bougie is swallowed once a day for a further fortnight. Thereafter, it is necessary to repeat the procedure twice weekly for 2 months and, finally, once a week for a further 6 months.

One can only marvel at the discipline and fortitude of the children of Austria and America. Martin and Arena (1939) are alone, amongst all who have written of the method, to mention the enormous amount of cajolery that their patients required to induce them to carry out the therapy to the end. They were successful with 3 children out of 50. Our success was even less. An attempt was made to persuade 6 children between the ages of 3 and 7 to swallow Bokay bougies. Doctors, nurses, social workers, physiotherapists and relatives were successively enrolled in an attempt to get that bougie down by the 5th day, and all in turn were defeated. After watching an exasperated volunteer endeavour to coax a bougie beyond a child's clenched teeth, one realized the wisdom of making the bougie of soft rubber. We have since used the technique exclusively on adults.

Five adults were treated by Salzer's method. They were selected because they were intelligent and willing to cooperate. All had swallowed concentrated caustic solutions and oesophageal involvement, of an extent which was considered sufficient to cause a stricture, had been confirmed by oesophagoscopy. The case reports are as follows:

Case 1. G.N., African female aged 17. Suicidal attempt on 15 March 1951.

On 19 March the patient was given a tablet of anethane to suck and was sedated with 1½ grains of luminal. Patience and encouragement was eventually rewarded by the successful ingestion of a size-15 Bokay bougie, which was retained for 5 minutes. This was repeated twice daily under sedulous supervision and was always accompanied by retching, spitting and pleading.

On 21 March a size-30 bougie was retained. This was passed twice each day but never easily and with ever-increasing resentment.

On 24 March oesophagoscopy revealed a persistent severe burn of the cervical oesophagus; the mucosa was denuded and the granulations bled as soon as they were touched.

On 28 March she was unable to swallow the size-30 bougie and no amount of cajolery was effective in getting her to pass it through the cervical oesophagus. She was then given a size-20 bougie and this she swallowed easily. Oesophagoscopy confirmed that a stricture had commenced to form, 17 cm. from the upper incisor teeth.

By 2 April the patient was unable to swallow this bougie and on 10 April the treatment was abandoned after she failed to swallow a size-10 bougie and had been almost reduced to a state of nervous prostration. She developed very extensive strictures and eventually a successful oesophago-gastrostomy was performed.

Case 2. L.D., Coloured female aged 23. Accident on 8 April 1951.

Oesophagoscopy on 11 April revealed circumferential mucosal ulceration, 20 cm. from the upper incisors. The Salzer regime was started on 13 April, when the patient successively swallowed size-10, size-15 and size-20 bougies with the greatest of ease. Thereafter she swallowed size-30 bougies twice daily until 21 April, when she experienced pain on passing the tube. When the tube was removed she vomited some blood-stained material. Oesophagoscopy on 22 April confirmed that a stricture had begun to form at 20 cm.

On 23 April she was given a size-20 bougie, which she was able to swallow satisfactorily. By 6 May 1951 she was again having difficulty and thereafter her treatment was supplemented by weekly antegrade dilatations under general anaesthesia. Barium swallow demonstrated tubular strictures in the upper thoracic and retrocardiac segments.

This patient did not return to out-patient clinic until 14 December 1952. She was then extremely thin and a very narrow stricture had developed. She had abandoned the treatment a month after discharge on 17 July 1951 as she was then swallowing well, but slight dysphagia began 2 months later. She then tried in vain to swallow her bougie, and over the course of a year the dysphagia got steadily worse.

Case 3. B.M., African male aged 25. Suicidal attempt 23 November 1950.

Oesophagoscopy on 27 November showed circumferential corrosion, 21 cm. from the upper incisor teeth. The treatment was started on 28 November and he was able to swallow a size-30 bougie immediately. This he continued to do each day until 2 January 1951, when he began to experience difficulty. Oesophagoscopy demonstrated a ring stricture at 20 cm. and a bougie encountered a second stricture at 27 cm. Thereafter he swallowed a size-20 bougie daily and this was supplemented by weekly dilatation, under anaesthesia, to size-26.

He was discharged on 18 February 1951, 3 months after the suicidal attempt, but neglected to swallow his bougie and was readmitted on 27 March 1951. Since then he has returned periodically for dilatations.

Case 4. A.H. African male aged 35. Accident on 4 September 1951.

On 5 September, oesophagoscopy revealed circumferential corrosive injury 25 cm. from the upper incisors. He only succeeded in swallowing the size-20 bougie on 8 September. The subsequent performances were nerve-racking for all concerned, as he never took kindly to the method. Frequently the bougie would be withdrawn blood-stained and after oesophagoscopy on 17 September, when persistent ulceration was seen, the treatment was abandoned. Barium swallow at that time showed that already a stricture had developed.

Case 5. A.G., Indian female aged 30. Suicidal attempt on 18 December 1950.

Oesophagoscopy on 21 December showed corrosion immediately below the crico-pharyngeal sphincter. The regime was commenced on 23 December and by 25 December she was swallowing a size-30 bougie. Each operation was courageously performed, even though considerable pain and bleeding were caused. On 7 January 1951 she experienced difficulty and barium swallow outlined a ring stricture at the thoracic inlet and a tubular stricture below the level of the aortic arch. The treatment was then abandoned.

It is difficult to gainsay the many excellent reports of the Salzer treatment, but in our experience the method has no effect whatever in altering the clinical course. We believe that the treatment cannot prevent the formation of a stricture whilst, by repeatedly traumatizing the ulcerated areas, it may actually do harm. It is hard to believe that daily bouginage can be so effective as to prevent the contraction of developing scar, yet this is what Blassingame, McArthur and Atkinson (1947), Gellis and Holt (1942) and Kernodle *et al.* (1948) claim for the majority of their cases. These workers have confined the treatment to children and in this connection Table IV is instructive.

TABLE IV. RESULTS OF TREATING CHILDREN WITH ACUTE CAUSTIC INJURIES

	Total Cases	*No. to Develop Strictures*	%	*End Result Satisfactory (No. Dysphagia)*	%	*Type of Treatment*
Bokay-Salzer ..	131	15	11·4	116	88·6	Salzer
Gellis and Holt ..	41	2	5	39	95	Salzer
Kernodle *et al.* ..	21	5	19	16	81	Salzer
Thoracic Surgery Unit, Johannesburg	36	8	22·5	33	91	Dilatation when healed

In each series all children with oral injuries were subjected to treatment. In the Thoracic Surgery Unit (Johannesburg) series all 36 children had oral injuries, but after early diagnostic oesophagoscopy only 8 were detained for treatment.

Every child in our series had an early oesophagoscopic examination and, even though they all had oral burns of varying severity, only 8 had sufficient oesophageal damage to produce strictures. Thus only 22% of children with oral injury sustained sufficient oesophageal corrosion to cause strictures. These unfortunate victims were treated by dilatations, at a time when we considered this was safe, and all but 3 were readily controlled. This policy of treating only those who are liable to develop strictures, has resulted in permanent freedom from dysphagia in 91% of all acute cases admitted. This success rate can be favourably compared with the published results of the Salzer treatment.

The logical objection to these comparisons is that our series includes 28 children who had little or no oesophageal injury, but the advocates of the Salzer regime have exercised little discretion in the selection of cases included in their reported series. Bokay and Salzer treated all cases with oral burns without direct visual proof of oesophageal corrosion. Gellis and Holt do not describe any attempts at precise diagnosis, and Blassingame *et al.* and Crowe state that oral burns should be taken as presumptive evidence of oesophageal involvement. It has been shown that mouth burns, even of very severe degree, are frequently found in the absence of injury of the oesophagus. It is obvious that to institute the Salzer method simply on this basis is to subject the majority of victims to unnecessary treatment.

Other Methods

It is difficult to abandon hope in the possibility of preventing the formation of a stricture. The logical

conclusion after reviewing the failures of the Salzer method, is that the scar has a great deal of time to contract in the intervals between bouginage. Leegaard (1945) has evolved a method of continuous internal splinting and has used it in 15 cases, though he does not give his criteria for diagnosing oesophageal damage. With children under the age of 1 year he passes a nasal bougie, but in all older individuals the tube is passed into the stomach through an external pharyngotomy opening and serves the double purpose of splintage and feeding. He does not discuss his results in any detail and we have not been inclined to treat our patients in this way.

The Effect of ACTH in Preventing Strictures

It is well known that surgical wounds heal with difficulty in animals under treatment with ACTH (Ragan, Grokoest *et al.*, 1949). This is thought to be due to decreased fibroblastic proliferation and inhibition of collagen maturation (Ragan, Howes *et al.*, 1949). It was therefore hoped that ACTH might have a beneficial effect upon caustic oesophageal strictures by preventing excessive fibrosis and delaying contraction of the scar.

Four adult patients with recent caustic injury were selected for the treatment. They were given daily intravenous infusions of 20 mg. of ACTH in a litre of glucose and water, for one week. Thereafter, the dose was decreased to 15 mg. daily for the second week and 5 mg. daily for a further 2 weeks. The solution was administered very slowly, an attempt being made to have the vacolitre last about 8 hours. The technique, though irksome for the patient and needing constant supervision, was considered to be the most reliable means of instituting what was then a somewhat novel therapy. Penicillin was given throughout the period of treatment. No untoward effects attributable to the hormone resulted. The following are reports of cases in which ACTH was administered:

Case 1. A.G., Indian female aged 30. Attempted suicide on 18 December 1950.

Treatment was begun the day after admission to hospital. On 24 December an oesophagoscopy was done and circumferential corrosion was seen to be present immediately below the crico-pharyngeal sphincter.

The patient was able to swallow fluids until 27 December, when she began taking porridge and other semi-solids. An attempt was made to get her to swallow a size-30 bougie and this was accomplished on 29 December. Oesophagoscopy was repeated on 3 January 1951, when persistent ulceration was seen 19 cm. from the incisor teeth. The walls of the organ appeared thickened and stiff, but the lumen had not contracted to the extent which one would have expected from the previous examinations.

On 10 January the patient, who had swallowed the bougie daily, reported that she had vomited blood after the procedure that morning. Bouginage was then abandoned. On 15 January oesophagoscopy was repeated and the findings were essentially the same as those of the examination 12 days earlier. The ulcerations had not lessened in extent and were still shaggy and unhealthy in appearance. The lumen had remained widely patent.

The treatment ended on 28 January and at that time the patient was swallowing very well. Oesophagoscopy next day revealed that ulceration was still present at 19 cm., though there appeared to be some slight regeneration of epithelium as compared with the previous examination.

Autobouginage was recommenced on 2 February 1951, but the patient was only able to swallow a size-18 dilator.

On 4 February oesophagoscopy showed that epithelium had covered the upper ulcerations and a ring stricture had now formed. This was dilated so as to permit the passage of a child's oesophagoscope, which was arrested at 25 cm. by a second stricture. The face of this second narrowing looked healthy.

Barium swallow on 6 February confirmed the presence of a ring stricture at the thoracic inlet, and a tubular stricture starting at the level of the aorta.

The patient was allowed home on 22 February 1951 with instructions to continue swallowing the bougie. She was last seen on 11 August 1951 and, though barium swallow confirmed the presence of the double strictures, these were still widely patent.

Case 2. L.S., Coloured female aged 33. Attempted suicide on 28 May 1951.

The treatment was commenced on the day of admission. On 30 May oesophagoscopy demonstrated that the crico-pharyngeal sphincter was in spasm. An infant's oesophagoscope was manipulated through, and 2 inches beyond the mucous membrane was seen to be corroded.

On 2 June an attempt to swallow a Bokay bougie failed, but the patient succeeded with a size-15 bougie on 7 June.

On 14 June oesophagoscopy showed that the spasm of the crico-pharyngeal sphincter had relaxed. The mucosa at 19 cm. had healed without a stricture, but at 20 cm. persistent unhealthy ulcerations were seen.

The patient was able to swallow with comfort and weekly oesophagoscopic findings remained essentially unchanged throughout the period of treatment, which ended on 2 July 1951.

On 13 July 1951 oesophagoscopy was repeated. An established stricture, with healed epithelial lining, was visualized at 21 cm. The passage of a size-16 bougie imparted a sensation of resistance to the operator.

The patient had swallowed a size-15 bougie throughout, and this she continued to do. Unfortunately on 20 July she had a sudden recurrence of delusions, hearing the same voices which had originally commanded her to attempt suicide. It was found necessary to commit her to a mental institution, where the medical officers were at pains to oversee her treatment. Her mental condition was successfully treated with electro-convulsive therapy, and we saw her again on 23 January 1952, when she was still swallowing the bougie daily.

Barium swallow demonstrated the presence of a ring stricture at the thoracic inlet and a retro-cardiac tubular stricture. The passage of a bougie imparted a sensation of resistance as firm and unyielding as a stricture of similar extent, untreated by ACTH.

Case 3. V.H., Coloured female aged 48. Attempted suicide on 25 August 1951.

This was a mild case, in which circumferential ulceration was sustained at 25 cm. (aortic arch). The treatment was started immediately on admission and weekly oesophagoscopies were performed. Again it was noticed that re-epitheliazation of the denuded mucosa was not so rapid as usual and that infection was persistent. One would have expected healing to have been completed in this case by the end of the 2nd week, but this was only observed 10 days after the ACTH was discontinued. In view of the limited damage, no attempt was made to get the patient to swallow a bougie and, whereas throughout the period of treatment with ACTH no narrowing of the affected segment had been seen, 10 days after its cessation a definite ring stricture had formed.

The stricture has been controlled by autobouginage and on 14 May 1952, when the patient was last seen, the narrowed segment was adequately controlled.

Case 4. J.M., African male aged 28. Accident on 31 August 1951.

The treatment was commenced after oesophagoscopy on 1 September, when the gullet was seen to be severely corroded at 24 cm. (aortic arch).

By 13 September a definite stricture had commenced at 24 cm., where the mucosa was still ulcerated. The following week the stricture was more evident. When a bougie was passed the walls were felt to be soft and yielding and the lumen was dilated to size 24 with the utmost ease. On 8 October, one week after the ACTH was stopped, the mucosa was completely healed. The stricture then readily admitted a size-18 bougie and presented no resistence to efforts at dilating it to size 24 (Fig. 9).

On 19 October 1951 the patient was discharged. He was readmitted on 28 December 1951, having lost 30 lb. in weight, and confessed that he had neglected to swallow his bougie. At endoscopy a stricture was seen at 22 cm., which would admit a size-8 bougie (Fig. 10). The walls were hard and unyielding and re-

dilatation was effected with considerable difficulty over the course of 6 weeks.

Fig. 9. Effect of ACTH. This radiograph was taken 8 weeks after injury and 1 week after cessation of ACTH. Severe corrosion was proved by early oesophogoscopy. The lumen remains widely patent.

Fig. 10. Effect of ACTH. Same case as Fig. 9, 10 weeks after cessation of ACTH therapy. A long dense tubular stricture has formed.

Our experience with ACTH is limited. A definite effect was accomplished in the initial stages, and strictures were delayed in their formation. In case 4 the stricture had commenced by the end of the 2nd week but was extraordinarily soft and dilatable. This effect upon the regenerating fibrous walls of the affected regions was maintained as long as the hormone was given.

It was noted in these 4 cases that infection persisted much longer than in untreated cases of comparable severity. Though this is probably due to the delay in healing, it will be recalled that Selye (1950) has reported that ACTH decreases the resistance to infection. Retardation of epithelial regeneration has been an undoubted result, again not an unexpected finding in view of Green and Bullough's demonstration that ACTH has the effect of depressing or suppressing mitosis in epithelial cells (1950).

ACTH may be a two-edged sword. It was noted in every case that ulceration persisted long after healing would ordinarily have been expected. Though penicillin therapy keeps gross infection in check, there is the danger that, so long as ulceration persists, destruction of specialized cells may continue, which can only be replaced by fibrosis. ACTH seems to suspend the processes of generation and maturation of fibrous tissue just so long as it is in circulation, and thereafter normal evolution continues unchecked and the scar inevitably contracts.

When to start Dilatation

Experience of acute caustic burns of the oesophagus has led to the conviction that, once the corrosive action penetrates into the oesophageal walls, scarring is inevitable. Nothing can prevent this and there is no practical method of avoiding subsequent contraction of the scar. Bouginage remains the sheet-anchor of treatment and the earlier this can be started the greater the chances of success. However, trauma may be caused by too-early instrumentation and this consideration, with the accompanying hazard of infection, must be weighed against the difficulties of dilating a tough, narrow stricture. It is now our practice to attempt dilatation as soon as weekly oesophagoscopic examinations show that the stricture face has epithelialized. An appropriate-sized, well-lubricated bougie is gently passed through the stricture and on withdrawal is examined for blood-staining. Should this be found, the presumption is that granulations are still present and attempts at dilatation must be postponed for a further week. The early regular passage of a fine bougie has the additional advantage of maintaining a straight lumen through the stricture, thus circumventing the grave danger of dilating a tortuous track.

In cases with mild limited injury, dilatation has been started as early as the 2nd week, whereas with severe damage 6 weeks or longer may pass before treatment can be attempted. With such a policy it is sometimes necessary to perform a gastrostomy before dilatation is attempted, and in such cases retrograde bouginage is preferred (Tucker 1931). No case in this series has had an oesophago-gastrostomy without a prior attempt to dilate, but in several instances of severe injury it would have been kinder and less hazardous had dilatation never been attempted.

SUMMARY OF RESULTS

Ninety-seven patients with acute caustic soda poisoning have been treated by the Thoracic Surgery Unit in Johannesburg during the past 5 years.

Five patients died in the early stages, 3 within 48 hours of admission and 2 during the 2nd week. At necropsy all these patients showed evidence of pulmonary corrosion, and death was due to pulmonary oedema and bronchopneumonia. The 2 patients who survived into the 2nd week had developed mediastinitis and peritonitis following necrosis of the oesophagus and stomach.

Ninety-four patients had oesophagoscopic examinations within a week of injury (3 fatal cases were too ill for this) and, though all had injuries of the mouth, only 57 were found to have oesophageal corrosion. These 57 were examined at weekly intervals, and in 16 of them healing of the corroded area without significant scarring had occurred before the 2nd week had passed. Forty-one patients have therefore developed strictures and 5 have died (47% of total) whereas 51 escaped serious oesophageal involvement. With children, most of whom took solid caustic or weak solutions accidentally, the escape rate was even higher. Only 8 out of 36 (22%) developed strictures.

It had been hoped that a method would be found effective in preventing the development of strictures. The Salzer technique and ACTH therapy were tried but were ineffectual in preventing this dread sequel. One is forced to conclude that, once the oesophagus has been severely damaged, a stricture is inevitable. The standard treatment now is to control infection with antibiotics and to commence dilatation only when the epithelium has regenerated to cover the denuded areas of the oesophagus. With severe extensive strictures this may

never occur and in these cases it is hopeless to expect dilatation to succeed in maintaining an adequate permanent lumen.

Three more patients have died as a result of treatment, one owing to a leaking jejunostomy, one after oesophagogastrostomy, and one from gastric haemorrhage following dilatation of her stricture. The total mortality has therefore been 9%. With the passage of time there may be further deaths, for patients with oesophageal strictures are subject to many complications throughout their lives.

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MICHAEL SERVETUS

HIS IMPORTANCE IN THE HISTORY OF MEDICINE

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The twenty-seventh of October 1953 was the four hundredth anniversary of the martyrdom of Michael Servetus in Geneva. It is therefore natural that there should recently have been a revival of interest in the life and works of this great Renaissance figure, if indeed this interest can ever be said to have died. Two American scholars have honoured the occasion by producing books which are of the greatest value to those who wish to study Servetus. Professor C. D. O'Malley of Stanford University has published an annotated translation of Servetus' geographical, medical and astrological writings. This translation is superior to any that has so far appeared, particularly in the faithfulness with which he has reproduced the meaning of the original Latin for the modern reader. Professor John F. Fulton of Yale has published a distinguished monograph on the life and death of Servetus. To it has been added a detailed and authoritative bibliography of Servetus' works by Miss Madeline E. Stanton, Librarian at Yale Medical Library, together with a census of known copies of these rare volumes.

This is not the place to repeat the details of Servetus' career. The aim of this article is to draw attention to and discuss the importance of his statements about the vascular system, widely celebrated as the earliest deviation from Galenic physiology. The few pages in which they are found, for which Servetus holds an honoured place in the history of the development of anatomical and physiological knowledge in the Renaissance, occur as an integral part of a theological work entitled *Christianismi Restitutio* and published in 1553, which led to his execution for heresy that same year. These statements about the heart and lungs apparently attracted no attention for about 140 years and were certainly unknown to Harvey when he published his discovery of the circulation of the blood in 1628. It has been suggested that Servetus' statements nevertheless indirectly influenced Harvey since they were known to—but not acknowledged by—Realdus Columbus, one of the writers whom Harvey quotes.

Since the re-discovery of Servetus' work a constant succession of medical historians have commented on the strange physiological interlude in what is otherwise a wholly theological work. So efficiently did the ecclesiastical authorities destroy the volume which they considered heretical that only three copies are known with certainty to have survived. It is thus not surprising that garbled and incorrect versions of what Servetus wrote were current for many years. Those interested in medical history therefore owe a great debt to the two American scholars already mentioned—O'Malley for his scrupulously accurate translation of Servetus' work and Fulton for his admirable essay and bibliography, which includes a facsimile reproduction of the two pages containing the essential part of Servetus' description of the heart and lungs, taken from the original 1553 edition. With such assistance, first-hand study of early writers is made possible for those who are remote from the original sources and—sad commentary on learning in this age—so often deficient in Latin.

THE BELIEFS OF GALEN

In order to appreciate Servetus' contribution it is necessary to rehearse what was generally believed in the sixteenth century to have been Galen's teaching about the movement of the blood. These beliefs were so strongly supported by ecclesiastical authority as to

constitute dogma, deviation from which was heresy. It must be noted that what was understood in the sixteenth century to be the teaching of Galen (who lived in the second century A.D.) was not necessarily what he actually wrote. Prendergast (1928) has shown by a careful and detailed study of surviving texts that Galen recorded, in different parts of his voluminous writings, different and sometimes contradictory statements about the movement of the blood. But in the Middle Ages his teaching was generally taken to have been along the following lines:

To Galen there were three important organs in the body, viz. the liver, the heart and the brain. Each of these was associated with a system of conduits, the liver with the veins, the heart with the arteries and the brain with the nerves (which were believed to be hollow). In each system of tubes there was found a different substance or fluid, charged with a specific *pneuma* or spirit. In the system of veins the venous blood containing 'natural spirit' was manufactured by the liver from the products of digestion of food in the gut. This ebbed and flowed to and from all parts of the body, according to the specific needs of each part. The right side of the heart was part of this system and the venous blood entered the *vena arteriosa* (i.e. the pulmonary artery) and was cleansed of impurities in the lungs by the process of respiration. The second system of vessels, the arteries, contained a different sort of blood charged with 'vital spirit'. This was manufactured in the left ventricle from venous blood which had been changed in some mysterious way during its passage from the right to the left ventricle *through the invisible channels which perforated the ventricular septum of the heart*. This changed blood was combined in the left ventricle with air brought to the left side of the heart by the *arteria venosa* (i.e. pulmonary vein). Arterial blood was distributed, again by ebb-and-flow movements, to all parts of the body. In the brain a third type of *pneuma*—'animal spirit'—was created and distributed to the body by nerves (believed to be hollow).

In the abbreviated account given above no mention has been made of the detailed functions of the three *pneumata*. It must be admitted that, if Galen's premises are accepted, his concept is ingenious and self-consistent, including and explaining all the facts known to him about the functions of the body. From a modern standpoint the system may appear somewhat grotesque, but then we have the advantage that William Harvey discovered and taught the circulation of the blood over three hundred years ago. Apart from the error inherent in the ebb-and-flow concept of blood movement, Galen made two errors (from a modern point of view) in his account of the blood (or rather the two kinds of blood) and its movements. The first error is quantitative and has been clearly expressed by Franklin (1949). According to the Galenic system only as much blood would move from the right to the left ventricle as is used up by the tissues at the periphery of the arterial system. Franklin stated that over a period this would roughly equal the amount of venous blood manufactured from the products of digestion by the liver. Now this equation is perhaps somewhat simplified, since it ignores the quantity of venous blood which might, according to Galen's ideas be consumed by the tissues at the periphery of the venous system. However, it does make it quite clear that the *amount* of blood transferred from right to left ventricle would be relatively small and the rate of flow correspondingly slow. The second error in Galen's system is the famous anatomical one: there are no passages, visible or invisible, through the ventricular septum of the heart. The influence of Servetus' work in correcting these two errors will be discussed below.

SERVETUS' CONTRIBUTION

Having described the framework of physiological ideas current in Servetus' times, let us turn to Servetus himself. In the celebrated passage of the *Christianismi Restitutio* (pp. 168-173), Servetus begins by describing how the divine spirit is a breath of air which God breathed into Adam's nostrils at the Creation and which He gives to every man who breathes. This is supported by numerous quotations from the Bible and from classical authorities. From the outset he thus focuses attention on the process of respiration and therefore on the lungs. Next he deals with the question of the three spirits (natural, vital and animal). There are not three spirits but rather one divine spirit, he writes. Yet he allows that this exists in three forms in the three systems, so that he does not in effect contradict this aspect of the Galenic system. Next follows further discussion of the Creation of Adam, during which he draws attention to the presence of an artery and a vein in the umbilical cord of the foetus. He philosphizes on this point, showing how artery and vein 'are always joined in us'. The next involved and—to modern minds—obscure passage ends with the statement that the 'divine spirit is in the blood', rather than in the walls of the heart, the brain or the liver. Bainton (1951) explains the attraction which the idea of the soul residing in the moving blood would have had for Servetus.

The next three paragraphs are those on which Servetus' fame in medical history depends. They deal with the creation of 'vital spirit', which is distributed by the arteries from the left side of the heart. After some phrases describing the qualities of this spirit, he writes:

> 'It is generated in the lungs from a mixture of inspired air with elaborated, subtle blood which the right ventricle of the heart communicates to the left.'

This is the general statement; he then proceeds to the details. The exact order of the following statements seems important, and they are therefore quoted in full:

> 'However, this communication is made not through the middle wall of the heart, as is commonly believed, but by a very ingenious arrangement the subtle blood is urged forward by a long course through the lungs; it is elaborated by the lungs, becomes reddish-yellow and is poured from the pulmonary artery into the pulmonary vein. Then in the pulmonary vein it is mixed with inspired air and through expiration it is cleansed of its sooty vapors. Thus finally the whole mixture, suitably prepared for the production of the vital spirit, is drawn onward from the left ventricle of the heart by diastole.'

It can be seen how Servetus visualizes the blood being *first* elaborated by the lungs, becoming reddish-yellow—evidently changing in some mysterious way—and *then* passing to the pulmonary vein where it is mixed with the inspired air. The reference at the end of the passage

to diastole as the process by which the blood proceeds from the left ventricle reflects the belief that diastole was the active process of the heart and arteries; this belief was first corrected by Harvey.

Servetus next gives the reasons which led him to this new conception. First he remarks on the 'different conjunctions and the communication of the pulmonary artery with the pulmonary vein in the lungs'. By conjunctions it is fair to assume that he referred to the numerous branches of the pulmonary artery and veins which are found lying together. The communication between them he could not, of course, observe, but they had been postulated by Galen and were in any case necessary to his 'long course through the lungs'. Second, he considers that the great size of the pulmonary artery indicates that it does more than simply nourish the lungs. Moreover (as Galen had shown) in the embryo the blood avoids the lungs, which must therefore be 'nourished from elsewhere'. Consequently when blood enters the lungs at the time of birth it must be 'for another purpose', i.e. not only to nourish the lungs. This observation was sound and a true advance on the views of Galen. It was, as can be seen, an anatomical observation. Third, Servetus reiterates the belief that the change in the blood and the mixture of air and blood do not take place in the heart, but in the lungs—this because he considers the left ventricle to be too small for the purpose—nor does the ventricular septum possess the 'vessels and mechanisms' necessary for the elaboration of the vital spirit, 'although something may possibly sweat through'. This last reservation indicates that Servetus could not completely free himself from Galenic doctrine on this point.

The vital spirit, elaborated in the way described, according to Servetus is 'transfused from the left ventricle of the heart into the arteries of the whole body . . . '. Fulton (1953) interprets this passage to indicate that Servetus had some idea of the greater circulation. However, without further evidence, it does not seem necessary to infer that by these phrases he meant anything more than was implicit in the Galenic distribution of vital spirit through the arteries, despite the fact that he does not specifically mention the ebb and flow of blood in them. Some support is lent to this simpler explanation by the context of the passage. The next two pages of Servetus' book are concerned only with the creation of 'animal spirit' from 'vital spirit' in the brain and its distribution to the sense organs of the body by way of the nerves; there is no suggestion of a *return* of the blood from the periphery, which, after all, is the *sine qua non* of a circulation. The remainder of the passage in Servetus' book which O'Malley translates is not of importance to the present discussion, being concerned with the functions and disorders of the brain and the situation of the soul.

THE NATURE OF HIS CONTRIBUTION

It is a remarkable fact that, despite 250 years of discussion, commentators are by no means agreed on the significance and importance of Servetus' contribution. A recent example of disagreement may be found in Trueta (1954), who challenges O'Malley's (1953) opinion that the basis of Servetus' conception is to be found in Galen's writings. If that were so, Trueta argues, why had not others noticed this passage of Galen's before? Surely the explanation is that those who believed in the short septal route from the right to the left ventricle had no need to consider an alternative. As to whether Galen was of any assistance, Harvey is an eloquent witness, for in the seventh chapter of *De Motu Cordis* he quotes Galen at length in support of his views on the existence of the pulmonary circuit.

Trueta (1948, 1954) and Fulton (1953) roundly describe Servetus as having discovered the pulmonary circulation. (Both authors are aware of the Arabian manuscript by Ibn an-Nafis (c. 1210-1288) discovered 30 years ago, which contained a clear description of the pulmonary transit of blood, repeated several times. But there is good reason to believe that Servetus had no knowledge of the Persian writer who had preceded him by three centuries).

Bainton (1951) is slightly less certain, and mentions some of the objections to the statement that Servetus discovered the pulmonary circulation; he uses the word 'transit' rather than 'circulation' in the title of his paper.

O'Malley (1953) points out that in view of what may be found in Galen and in Vesalius' famous first edition of the *Fabrica*, which was published in 1543, no great originality was displayed by Servetus. On the other hand O'Malley refers to the famous passage as 'the first printed account of the circulation of the blood through the lungs'.

Izquierdo (1937), who according to Bainton followed the views of Max Neuburger, placed an even greater restriction on Servetus' contribution, contending that nobody who held Galen's views on the origin and distribution of blood in the veins could have grasped the idea of the circulation of the blood through the lungs.

Franklin (1949) has expressed similar views, laying stress on the quantitative aspect of the question, which, in his opinion, disallows the use of the word circulation (in its modern sense) before Harvey's time.

Can one judge between these views? It is my belief that if Servetus' account is considered in the context of sixteenth-century Galenic doctrine, it is possible to decide how far and in what direction Servetus deviated from Galen's teaching. This, after all, is the crucial decision; on it must depend any assessment of Servetus' achievement in the development of knowledge about the functions of the vascular system.

The first obstacle to such an assessment is the fragmentary nature of Servetus' account. Clearly Servetus had no intention of describing the mechanism of the body except in so far as it concerned the movement of the divine spirit through the body after it had been inspired as air. As O'Malley has expressed it, Servetus was more interested in tracing the movements of the spirit in the body than in the movement of the blood in which it was contained. Nevertheless, it is clear that the general plan of Servetus' account follows Galenic teaching closely, which is not surprising, since Servetus was in other matters a strict disciple of Galen. His vital spirit is elaborated in two stages as in the Galenic system, first as a change in the qualities of the blood as it passes from right to left ventricle (but taking place in the lungs rather than in the septum); second when the changed blood is mixed with air (in the pulmonary vein rather than in the left ventricle). There is no evidence on which to base an opinion that Servetus had any intention of challenging the quantitative basis of Galen's system. In fact, the closeness with which he follows that system indicates that, from our modern standpoint, he followed Galen into the same quantitative error as has been described above.

On the other hand, Servetus clearly contradicts the Galenic belief that blood flowed through the ventricular septum. Whether he or Vesalius deserves credit for first questioning this famous error, does not seem to me to be as important as the fact that Servetus drew the logical conclusion from his observation, thus emancipating himself from this part of Galenic doctrine in a manner which Vesalius quite failed to do. The genius of Servetus is that he brought together this observation about the septum with another on the great size of the pulmonary artery and so arrived at the central importance of the lungs. The fact that he was attracted to this conclusion by his theological position and that he could have no real understanding of the functions of the lungs only makes it the more remarkable that he should have got so far. Again it does not seem to me very important whether or not Servetus could have gathered his ideas from Galen; the role he describes for the lungs is vastly different from anything Galen had in mind.

It is therefore with no intention of decrying Servetus that I suggest that his achievement should be regarded as more anatomical than physiological. Certainly he drew from his accurate anatomical observations functional conclusions; but the functions he was concerned with were strictly Galenic. The fact that his conclusions seem so aptly to fit the modern knowledge of the circulation is to a large extent an accident. Galen's system required movement of some blood from the venous to the arterial system. If the septal route from the right ventricle did not exist, what alternative was there to its passage through the lungs? It is my belief that it is this accident which has misled those who now claim that Servetus described the pulmonary circulation.

Such an assertion is altogether too sweeping. Of the opinions quoted above those of Izquierdo and Franklin would seem to me best supported by the facts. On the other hand, these writers have perhaps underestimated Servetus' anatomical achievement. To deny Servetus any of the credit which belongs to William Harvey is not to diminish his fame as one of the earliest who dared question any part of the Galenic doctrine.

Servetus' life and martyrdom can be seen as an assertion of the right of men to proclaim the truth as they see it, an assertion for which, in that intolerant age, he paid the supreme penalty. His contribution to medical thought was but a small part of his life's work. Nevertheless, were it his only claim to fame, it would be sufficient. Coming at the time it did, it established his right to be remembered as one of the pioneers who began the process of freeing medicine from the baneful influence of the Dark Ages.

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SOME IMPRESSIONS OF THE VALUE OF HEPARIN IN THE SURGICAL TREATMENT OF PERIPHERAL ARTERIAL OBSTRUCTION

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Acute obstruction of the main arteries of the extremities occurs fairly often, and may involve the tragic loss of a limb. The attempt to relieve such an obstruction of the blood flow by surgical means is evidently indicated, but it is often frustrated by various factors. One important factor determining the surgical outcome is the distal and proximal progression of the clot, which occludes important collaterals, and particularly the distal vascular tree. This prevents the establishment of main arterial circulation by the deviation of the blood flow round the site of obstruction through dilated collaterals, or re-establishing it by extracting the obstructing clot or bridging the gap by means of some type of graft.

The results on a small series of cases do not allow of statistical conclusions but, when results are definite, certain impressions are valid and worth while recording. The value of heparin in preventing progression of thrombosis and thereby enhancing the chances of successful surgery has been reported by others. My own experience with heparin in 3 recent cases of acute circulatory deficiency of the lower extremity has impressed me with its value and I propose to report and discuss these cases.

CASE REPORTS

Case 1. European male 50 years old. In 1951, before coming to South Africa, he developed deep thrombosis of the right leg, with repeated thrombo-embolic episodes, and eventually recovered after 3 months' critical illness in hospital. In July 1953 after an attack of influenza he developed a deep thrombosis of the left leg, followed soon by a major pulmonary embolism. To forestall the grave danger of a second, possibly fatal, embolus, bilateral ligation of the superficial femoral veins was advised, and carried out the same evening, under local block anaesthesia. In the left leg, the loosely adherent clot, extending up the common femoral vein, was extracted and the superficial femoral vein ligated and transected. Heparin administration was started intravenously at this stage. The left femoral vein was fibrosed and densely adherent to the artery, which had to be separated with some difficulty and went into extreme spasm. The danger was borne in mind of losing the artery and accidently including it in the ligature under these circumstances. The superficial femoral vein was ligated and

transected. The administration of heparin was continued. The patient was returned to his bed at about 10 p.m. When he was visited next morning at about 10 o'clock the right leg, from the knee downwards, was found to be completely ischaemic. Lumbar block failed to improve matters, and ruled out the possibility of severe reflex arterial spasm.

At about noon, therefore, the artery was re-exposed, under general anaesthesia, and it was found that notwithstanding the precautions taken the artery had been included in the ligature and transected. Continuity was re-established by means of an end-to-end anastomosis, and this was followed by a lumbar sympathectomy. The peripheral pulses returned, and circulation has been normal ever since.

He incidentally developed an acute intestinal obstruction one week later, and an adhesive terminal ileal obstruction was found and released. Complete recovery followed, with full use of limbs.

In March 1954 the patient suddenly developed pain, numbness, and lameness in the left leg one morning at 10 o'clock. The left leg was ischaemic from below the groin downwards, and femoral and distal pulses were absent. No heparin could be given until he came to operation at 3 p.m. Under general anaesthesia the common iliac artery was exposed extra-peritoneally and an old partially-organized clot completely obstructing the flow at the junction of the external and internal iliacs was extracted. After arterial suture the external and internal iliacs pulsated normally as far as they were accessible. A lumbar sympathectomy followed. Heparin was given intra-arterially and intravenously after arterial suture had been completed.

On return to the ward ischaemic phenomena gradually shifted to below knee level and the femoral pulse became palpable. Next morning from about 8 o'clock the ischaemia extended higher and the condition of the leg deteriorated. The possibility that this later deterioration, with the femoral pulse present, might be due to the lodgement of another clot at the fork of the common femoral artery seemed to justify further exploration of this segment. At 10 a.m. the common femoral artery up to below its bifurcation was exposed, under local block anaesthesia. Pulsation stopped at the fork, the distal superficial femoral being contracted and pulseless. The usual bulging of a lodged clot was absent. The superficial femoral artery was opened and only a thrombus of recent formation extending downwards could be extracted. Pulsation was present in the exposed segment of the superficial femoral, after successful arterial suture. After this some slow improvement of circulation occurred, so that a below-the-knee amputation could be undertaken, after demarcation. Heparin administration was continued for 5 days and then replaced by dicumarol medication carefully controlled every day.

The origin of the thrombus could not be definitely established. Clinical, radiological and E.C.G. examination failed to suggest intracardiac origin. Presumably atheromatous ulceration of the aorta acted as the initiating site of origin.

Case 2. European male aged 78 years. In the early hours of 12 December 1953 he developed sudden pain and lameness in the right leg. His doctor, who diagnosed an arterial embolus, consulted me by telephone. He was advised to give heparin immediately; this was about 1 hour after the onset. I had to travel a considerable distance to the patient, and he only came to operation at about 4 p.m.—11-12 hours after the onset. All peripheral pulses on the right leg, except the femoral in the groin, were absent. Ischaemic phenomena were well marked from the knee downwards. Under local femoral block anaesthesia, the femoral artery was exposed. Pulsation was absent beyond the superficial femoral origin and the usual bulge of a lodged embolus was seen at the bifurcation. An old clot was extracted and the arteries were allowed to flush through. No recent extension of clot-formation in the distal arterial segment was noticed at operation. After successful arterial suture, notwithstanding some atheromatous changes with hardening, the superficial femoral and profundus pulsated satisfactorily. Heparin, 50 mg., was given slowly through a fine needle into the artery above the line of suture before closing the wound. The patient was turned on his left side for the administration of a novocain lumbar block. While I was busy finding the landmarks with the needle, before actually making the injection, the patient developed a rigor and went into peripheral circulatory collapse. The procedure was therefore abandoned and the patient returned to his bed. He recovered from this state of collapse in about an hour's time, after which the foot became warm and the peripheral pulses gradually returned.

He recovered uneventfully and regained full use of the limb. As no cardiac pathology, possibly acting as a nidus for the thrombus formation, could be detected, it was again presumed to have originated in the aorta.

Case 3. European male aged 83. He was admitted to the Boksburg-Benoni hospital on 25 August 1954 and was seen by the assistants on duty in my department. The right leg had suddenly become ischaemic from just below the knee downwards. The popliteal pulse was felt, while those of the dorsalis pedis and posterior tibial were absent. The possibility of an embolus was considered, but it was argued that the high level of ischaemia could not be accounted for by an arterial obstruction at the level of the popliteal fork, and that more extensive local thrombosis must have occurred. He was therefore heparinized and lumbar blocks with only slight effect were given. When I saw him on 27 August, marked ischaemia of the leg was present. When the popliteal pulse was felt, prominent pulsation was immediately noticed, and on closer examination it was evident that there was a popliteal aneurysm, which had escaped notice by the previous examiners. Sudden local clotting up of the aneurysm, with obstruction of the distal and collateral blood-flow, would explain the rather sudden onset of ischaemia 2 days before. At about 3 p.m. the popliteal artery was exposed under local popliteal nerve block. After mobilization of the fusiform aneurysmal sac, the superior and inferior genicular were seen to arise from the upper and lower borders respectively of the aneurysm. After evacuation of the clot, the sac was excised. The intima round the ostia of the collaterals, which were patent, were noted to be intact. Recent clotting into the distal arterial tree was present. After this was extracted, a good-sized lubricated ureteric catheter was introduced distally and the arterial tree washed out with saline containing 50 mg. of heparin. Some smaller clots were dislodged this way and washed out. Saline with heparin was then forced through the distal arterial tree. By trimming away all the atheromatous destroyed intima up to the level of the intact intima a gap of 2 inches was created which could only be bridged by a graft. The most suitable popliteal vein was prepared for grafting and sutured into place. After successful arteriovenous suture the remnants of the posterior wall of the sac were wrapped and sutured round the graft as reinforcement. Good pulsation through the graft and into the distal artery, as far as accessible, was present. A lumbar novocain block, followed by 10% phenol, was administered. The ischaemia gradually disappeared and by the next morning the leg was warm up to the toes. The patient was kept on heparin for 5 days after operation. The limb, except for a necrotic distal phalanx of the big toe, has fully recovered and he has full use of it.

The venous graft has become somewhat dilated, but is functioning well. Its ultimate fate still has to be decided. It might prove necessary to replace it with an arterial graft.

DISCUSSION

The administration of heparin as an adjunct in the treatment of arterial obstruction, although generally advised, has also been opposed, notably by Professor Boyd of Manchester, who has warned against possible deleterious effects, particularly if the drug is used without strict control. The estimation of clotting time, by Lee and White's method, can be learned and carried out by any doctor. It is generally advised that heparinization is adequate when clotting time is prolonged to 2 or 3 times its original level. Some Swedish authors, however, have pointed out that the clotting time does not necessarily truly reflect the complex intravascular clotting tendency, and that comparatively small doses of heparin, without producing an appreciable change in clotting time, can still give protection against intravascular clotting. Without going into the arguments for and against the different methods of administration, my experience has convinced me that in practice the Cosgriff method is the most practicable and the safest. This is the method that I employed in these 3 cases.

An intravenous priming dose of heparin (25-50 mg.) followed in an hour by 3-hourly subcutaneous injections of relatively small doses (the 1st 50 mg., the 2nd and others 30 mg.) produces a moderate and fairly well sustained prolongation of clotting time.

It is generally accepted that the chance of success rapidly decreases after the first 6 hours following onset, and that after 10 hours it is practically nil. Roughly the times that elapsed between the onset of obstruction and successful release in these 3 cases was 14, 10 and 15 hours respectively. Case 1 is particularly instructive and suggestive, because in the same patient the 1st attempt succeeded after 14 hours had elapsed whilst the 2nd attempt failed after only 6 hours had elapsed and thrombus formation had already occluded the distal arterial tree, as confirmed by operative findings. The only apparent difference on the 2 occasions was the early heparinization on the 1st occasion and its absence on the 2nd. Not only was the time interval on the 1st successful occasion more than twice as long, but local conditions also favoured thrombus formation at the site of arterial suture; it was not possible to excise the traumatized and devitalized ends of the artery because this would have prevented end-to-end approximation.

At the execution of the 2nd unsuccessful attempt in case 1, the idea of washing out the distal arterial tree with saline containing heparin had not yet occurred to me. I feel that this is a helpful measure for getting rid of additional obstructing thrombi and maintaining patency. There is experimental and clinical reason to believe that heparin when brought into direct contact with a thrombus has a lytic effect.

A perusal in the literature of the experience of others, particularly of such an experienced worker in this field as Sir James Learmonth, gives a rather gloomy impression of this subject. The successful outcome of 3 cases of arterial obstruction within 1 year induces me to believe that the early administration of heparin had something to do with it. Technical differences can be taken as excluded and sheer chance does not seem a likely explanation.

CONCLUSION

Alertness on the part of the practitioner, and close collaboration with the surgeon, can often avoid the tragic loss of a limb, or even a life, as the result of arterial obstruction. The diagnosis should be made promptly, and this can be done if the possibility of arterial obstruction is borne in mind and the limb is at least examined for ischaemic phenomena.

The normal popliteal artery is not easily palpated. Excessive prominent pulsation felt on palpation should immediately suggest the possibility of an aneurysm and invite further investigation (case 3).

All obstructive arterial lesions of the lower extremity below the level of the aortic fork can be dealt with under local anaesthesia. Although a large percentage of these cases are suffering from pathological conditions of the heart, very few will be too ill to stand the operation under local. There is no objection to general anaesthesia if the patient's condition allows it, but spinal is contra-indicated lest release of spasm should permit the embolus or part of it to slip further down. As pointed out, heparin administration at the earliest possible moment is essential. If given carefully under control, according to Cosgriff, its benefit in my opinion far outweighs its possible dangers.

I have not found oozing to be uncontrollable at operation where the patient was heparinized beforehand; if it were so it could easily be overcome by the intravenous administration of protamine sulphate.

The washing-out of distal clots with saline and heparin through a ureteric catheter is a valuable adjunct for procuring and maintaining patency and thereby ensuring success.

After removal of the obstructive lesion, some form of sympathetic denervation should follow, according to circumstances and the patient's condition.

I wish to thank Drs. Jacobs and Vetter who kindly referred two of the cases, as well as Dr. Swanepoel, Superintendent of the Boksburg-Benoni Hospital for allowing me to publish Case 3.

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REVISION SERIES

VIII. ANAESTHESIA IN GENERAL PRACTICE

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Durban

The tendency today is for patients for operation under anaesthesia to be admitted to hospitals and nursing homes; and they are seldom anaesthetized in their own homes. It follows, then, that general practitioners, except those who practise in remote areas, anaesthetize their patients in consulting rooms, nursing homes or hospitals. The remote country practitioner is at a grave disadvantage because he is often obliged to work single-handed and greatly handicapped by lack of skilled assistance.

General practitioners who administer anaesthetics may be divided into 3 categories:

1. There are those who combine anaesthesia as a 'slant' with their general practice. They are often attached to hospitals and administer large numbers of anaesthetics, acquiring a high degree of skill and experience, which puts them into the same rank as the specialist.

2. The great bulk of general practitioners, who may be described as 'occasional anaesthetists' and who administer anaesthetics for minor surgical, obstetrical and dental procedures which arise from time to time in the course of general practice.

3. A group that may be described as 'very occasional anaesthetists'. They mostly practise in remote areas and have given a minimum number of anaesthetics since the 'statutory twenty' of undergraduate days; if possible they would altogether avoid the administration of anaesthetics.

It is to these latter groups (2 and 3) that the remarks in this article are addressed.

The ideal anaesthetic agent should have a high degree of safety, should be easily portable, should be as pleasant as possible from the patient's point of view, and should afford maximum facility to the surgeon operating.

APPARATUS REQUIRED

This includes the following:

Inhaler. No anaesthetic, however brief, should be administered to any patient unless the administrator has available a simple type of inhaler. This consists of a mask, with expiratory valve, attached to a rubber reservoir bag which by tubing can be connected to an oxygen cylinder. This simple apparatus is invaluable for resuscitation and administration of high-concentration oxygen, and is used to ensure adequate pulmonary ventilation by intermittent pressure on the inflated bag.

This apparatus is readily portable, especially if attached to a 6-cubic-foot oxygen cylinder with a simple type of reducing valve. Compressed air may be used instead if oxygen is not readily available. As an alternative to this a small concertina hand-bellows (Macintosh) is even more portable because the cylinder and reservoir bag above described are dispensed with. This simple apparatus allows fresh air to be pumped into the lungs as long as is required.

Schimmelbusch-type of Mask for the administration of ethyl chloride and ether.

Cylinder of Carbogen (i.e. 6% Co_2 in oxygen), with attached reducing valve.

Syringes and Needles. Ten c.c. and 20 c.c. syringes with an assortment of needles for local, intravenous and caudal techniques.

ANAESTHETIC AGENTS AND TECHNIQUES OF CHOICE

1. *Ether*

My advice to the 'occasional' and the 'very occasional' anaesthetist is to learn how to give 'open drop' ether. In spite of its objectionable and irritating odour, with careful and judicious administration ether can be given in a tolerably pleasant manner, and it has the redeeming feature of being a safe agent in the hands of infrequent users. A trickle flow of carbogen under the mask will encourage more even respiration, and less tendency to swallowing, breath-holding, coughing and laryngeal spasm, and will make the induction less tedious. Ether has the advantage of illustrating clearly the stages in anaesthesia and one knows exactly where one is with it. It has stood the test of more than 100 years and is still used extensively all over the world—in some clinics almost exclusively, even for thoracic surgery.

The use of ether—an inflammable vapour—is contra-indicated where the cautery is used, and of course in the presence of a flame or an open fire.

I would recommend Guedel's book *Inhalation Anaesthesia* as a fundamental guide. It is most readable and will be of great help in the solving of many anaesthetic problems.

2. *Local Anaesthesia*

This is most useful for many of the minor surgical procedures in general practice, and is used not nearly enough. With proper approach it can even be used very satisfactorily in young children.

The factors which make for success in the administration of local anaesthesia are accuracy of placement of the local anaesthetic solution, adequate time for it to act, and the addition of adrenalin chloride in dilution of not more than 1 in 250,000 (except in digital surgery, where the adrenalin must be excluded). A wheal should always be raised before administration and gentleness of technique of injection avoids unnecessary pain.

There is very little difficulty in the technique of local anaesthesia, and it causes minimal general disturbance to the patient; and of course its extreme portability is most advantageous.

Procaine hydrochloride, ½-1%, suffices for most purposes, and more concentrated solutions (2-3%) should be used where the solution is placed in close proximity to larger nerves or nerve trunks and roots.

There are many books which illustrate the technique of local anaesthesia and it is not difficult to acquire skill at it.

3. *Caudal Epidural Anaesthesia*

This is a technique with which general practitioners should become acquainted. It should be taught in the undergraduate phase because of its wide application in general practice. It needs practice for perfection. In brief the technique consists of the passage of a needle through the sacral hiatus into the caudal canal, and injecting 1% Procaine (with adrenalin), 40-50 c.c., scrupulous asepsis being observed.

The technique is carried out more easily with the patient in the prone position with pillow support of the pelvis, and the feet in the 'pigeon toe' position. It can also be carried out with no great inconvenience in the left lateral position with the right leg flexed at the hip and knee. This is the position most comfortable for administering to the pregnant patient. The insertion of the needle may be difficult because of anatomical abnormalities of the sacrum, and adiposity which obscures landmarks, but in general the technique presents no great difficulty and can be carried out painlessly and effectively.

Caudal anaesthesia has the advantage that there is

no element of inflammability and it can therefore be used in the presence of the cautery, etc. It is useful for any procedure in the 'saddle area', dilatation of urethral stricture, forceps delivery, stitching of perinaeum, haemorrhoids, ischio-rectal abscess, fissure-in-ano, etc. The dangers must not be overlooked which come from sepsis, broken needles and inadvertent entry into the theca.

OTHER AGENTS IN ANAESTHESIA

Ethyl Chloride is indeed useful for young children and infants, carefully administered, not for the purpose of full anaesthesia but rather to put the child into the state of accepting irritating ether vapour without struggling or resisting. It can very often be used for this purpose in adults too.

Pethidine Hydrochloride. This is most useful in doses of 25-50 mg. administered intravenously, especially where local anaesthesia is not quite adequate.

Thiopentone. This is an anaesthetic agent very widely used, and for which patients clamour. There is no question at all about its pleasantness for induction and its ready portability, but a warning must be sounded as to its danger. It is said that more people die today from thiopentone than did during the chloroform era. It has been significantly described as 'dead easy to give'! Its best use is not as an anaesthetic (it is not one) but to induce sleep before the administration of an anaesthetic. The tendency for severe laryngeal spasm to occur when 'open drop' ether is used after thiopentone induction makes it quite unsuitable for this purpose. If it is used in excessive dosage, not only is it dangerous because of severe respiratory depression, but waking-up time is much prolonged, and there is very often uncontrollable restlessness during the recovery period. It is an agent which requires great care for its safe usage. The danger of inadvertent intra-arterial and intra-neural injection of thiopentone should be carefully noted.

The Relaxants (Curare and synthetic curarizing agents). These are definitely outside the scope of the 'occasional' and 'very occasional' anaesthetist. Their use is invariably followed by apnoea, sometimes prolonged for many hours, and the danger of regurgitated stomach contents causing suffocation is extremely great. In a recent analysis covering 600,000 anaesthetics it was found that the death rate was increased sixfold when relaxants were used.

Trichlorethylene. An inhaler apparatus is necessary for the administration of this agent and, although it is a good analgesic, it has dangers when pressed to anaesthetic level.

PRE-OPERATIVE PREPARATION OF PATIENTS

No patient, young or old, should be subjected to any operation, minor or major, without pre-operative preparation, psychological and physical. Adequate premedication, not overdosage, is of the greatest importance. With children 1/200—1/100 gr. of atropine hypodermically ½-1 hour before operation, and ½-1 gr. of pentobarbitone sodium by mouth 2 hours beforehand, makes the child placid or even sleepy and allays fear, and crying will be obviated. Personality changes have been noted in many children, especially those of 2 and 3 years of age, who have been submitted to anaesthesia and operation without premedication, the changes reported being night terrors, temper tantrums, bed wetting, etc. The study of children in all age-groups has shown that if crying and struggling took place during induction, then one or more of these personality changes was likely to occur. These studies prove how important premedication is and how necessary kindness is on the part of the anaesthetist.

With adults premedication is especially indicated in very nervous subjects. In minor operative procedures the premedication must be of such a nature that it will not delay the time the patient shall become ambulant. Aspirin and codeine, or pentobarbitone sodium, will not delay recovery. On the other hand if the operative procedure is a little more profound, adequate premedication with omnopon gr. ⅓ and scopolamine gr. 1/150, 1½ hours before operation, will not only allay apprehension but will tend to lessen the amount of anaesthetic needed. It must be noted that scopolamine has a marked drying effect on the secretions, apart from being an excellent amnesic. It is necessary to administer premedication at least one hour before operation because of the initial phase of stimulation which precedes the depression; it is obviously undesirable for the patient to be operated upon in a stimulated state.

DIFFICULTIES AND DANGERS IN ANAESTHESIA

Before every anaesthetic the patient should be physically examined and it is important to ascertain the existence of allergy and idiosyncracy and to obtain the history of previous anaesthetic administration. The anaesthetist must be aware of the existence of obstruction in any part of the respiratory tract, and if this is of gross nature he must avoid general anaesthesia and resort to local anaesthesia. The importance of a clear airway and avoidance of anoxia cannot be overstressed. This is so in all cases, and especially in the aged, where anoxia may prove fatal. It is not necessary to employ electrocardiography to assess the cardiovascular status. The patient's history is a good guide; so also is his exercise tolerance.

The Danger from Stomach Contents

While the history of the patient as to the time of ingestion of food or the time of the last meal is important, there is no certainty that by 3 or 4 hours after a meal the contents will have passed on from the stomach. When operations are pending and especially in cases of emergency there does seem to be a slowing up of the passage of food. This is well demonstrated in small children and infants. It is as well to delay 5 or 6 hours after a meal in non-emergency or elective cases for surgery, but in the dire emergency, where there is danger to life in delay, then despite the unpleasantness to the patient, one must resort to gastric lavage if a general anaesthetic is to be administered. This must not be carried out with a Ryle's tube, but with a large-bore stomach tube. The passage

of the tube may be facilitated if the patient is made to suck an anaesthetic lozenge beforehand.

Gastric lavage is a very unpleasant procedure, unnerving and distressing to both patient and operator. But the inhalation of stomach contents is a tragedy which must at all costs be prevented and unless the operation can be delayed until the contents have passed on there is no other way of preventing it. A stomach tube should be tied to the anaesthetic mask to remind the anaesthetist of the ever-present likelihood of a full stomach.

Attention must be drawn to the risk of aspiration of stomach contents in complicated midwifery, where obstetrical manoeuvres are to be carried out under general anaesthesia and in emergency. Labour-ward management in many institutions is such that feeds are given from time to time during the course of labour. The danger of this practice is seen when sudden emergency arises, and anaesthesia has to be administered without delay in order to save the mother or child or both. To obviate this danger a rule should be instituted that no solid food should be permitted during labour. To combat exhaustion and acidosis the mother is encouraged to take fluids and glucose in the first stage of labour, and if acidosis has been established intravenous glucose may be administered. Epidural caudal anaesthesia is the method of choice in these cases. Failing this, if there is the slightest suspicion that the stomach is not empty, there must be resort to the stomach tube followed by 'open drop' ether.

Much has been written recently on the posture of the forceps case for general anaesthesia. The consensus of opinion is that the left lateral position is safest from the point of view of avoiding the danger of inhalation of vomit, and that the lithotomy position tends to increase the risk of regurgitation of food into the hypo-pharynx followed by inhalation. During induction of general anaesthesia the foot-down tilt is the safest and most satisfactory where it is suspected that the stomach may not be entirely empty; and this position is strongly advocated.

SUMMARY

1. Safe anaesthetic techniques have been discussed for 'occasional' and 'very occasional' general-practitioner anaesthetists.

2. The methods of choice are 'open drop' ether, local anaesthesia, and caudal epidural anaesthesia.

3. The dangers of thiopentone and relaxants are stressed.

4. The necessity for pre-operative preparation, psychological and physical, is discussed.

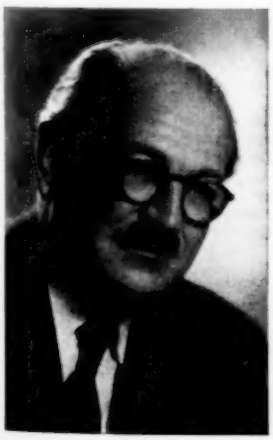
5. The importance of a clear respiratory tract and empty stomach are emphasized—the former from the aspect of dangerous anoxia, and the latter from the aspect of dangerous inhalation of stomach contents, leading to asphyxia and death.

ASSOCIATION NEWS : VERENIGINGSNUUS

DR. J. H. L. SHAPIRO'S PRESIDENTIAL ADDRESS AT ANNUAL MEETING OF CAPE WESTERN BRANCH

Delivering his valedictory address as retiring President of the Cape Western Branch of the Medical Association of South Africa at the Annual General Meeting of the Branch on 28 January 1955, Dr. J. H. L. Shapiro said:

Since one must speak of those things of which one is best qualified to speak, I shall confine myself to such simple everyday things as the art of simple living and the pursuit of happiness, the striving towards which concerns us as doctors as much as it does our lay fellow beings. Happiness would appear to be a state of being for which we doctors have singular difficulty in finding sufficient leisure time.



Dr. J. H. L. Shapiro

The Jewish sages of the post-biblical era preached that it was sinful to hold oneself apart from the community or the body politic. The hermit who was acceptable in Graecian philosophy was frowned upon by the Hebrews. The Babylonian Schools held it to be sinful to be an aesthete, to forswear indulgence in wine and good living, as was a common practice among the saintly of other religious faiths. How true it is even in these days that success in one sphere of existence often fails to bring complete satisfaction to the individual. Hobbies are but a partial remedy; those hobbies which bring us into closer contact with organized groups of enthusiasts are more effective than the more personal ones. It is gratifying to see that doctors are beginning to take a larger part than heretofore in national and provincial politics and in municipal affairs, and are concerning themselves with organized welfare work and charity apart from pure Public Health.

The desire to be of service is developed in the medical student in his clinical years when his close contact with the hospital class of patient gives him the harrowing realization of their poverty, misery and despair, and of how great is their need for a helping hand. After going into practice he finds it extremely frustrating to have to prescribe medicine when what the patient really needs is the means wherewith to obtain enough food, clothing and shelter—with enough to spare to combat his sense of insecurity and his fear of want.

THE MACHINE AGE

There is something gravely wrong with what we call Modern Civilization, this Machine Age, or age of technology, in which science has taken the bit between her teeth and has become almost uncontrollable. Technology and the Machine are no longer the servants of man, they have become his masters. Man as an individual is losing his importance; he is now too small a cog in the system. Only the Group now has any meaning, or is deserving of consideration. As long as the Industry thrives, the happiness of the individual worker is of minor importance. True enough, if there is a slackening off in production, if the graph begins to show a downward trend, it becomes worth while to Industry to budget for some social and welfare amenities, but in a strictly impersonal way.

If the State succeeds, it matters not that the individual is enslaved or—dreadful thought—is exposed to the threat of mass slaughter.

Even our own, the noblest of professions, is not immune from the deadening influence of mass thought and mass action. The pleasant and happy relationship between patient and doctor, which used to be the rule, is now the exception in organized communities.

In the name of the new god Efficiency the patient is no longer an individual man suffering from bodily or spiritual unhappiness, but only another case in the category of a certain disease-type for which science and research have provided lines of treatment.

In this age of technology the training of the doctor is also suffering revolution. No longer, apparently, is there need for the humanities, for art, for some knowledge of the classics. The curriculum is overloaded, the University can no longer fulfill its purpose of teaching the student wisdom to differentiate between the probably right and the probably wrong; it has now to provide a technical training and there is not the time for anything else. The Medical Faculty is being degraded to the level of a trades school. The postgraduate student receives an intensive instruction, learning more and still more about less and still less, until one begins to wonder if in the course of time he will get any more satisfaction out of his life's work than the skilled artisan who spends the whole of his working life drilling a succession of holes in a succession of steel plates without ever tasting the satisfying experience of having made one complete article.

Too often, moveover, the individual patient, bowing to the same god Efficiency, sinks his own individuality into a group or benefit society and his relationship with his doctor is no longer that of an individual man with a friend and counsellor of his choice, but of a member of a group with an employee of that group.

We cannot deny the efficiency of this system. If efficiency means getting something done more quickly and more cheaply the members of the benefit society may be lulled into some semblance of satisfaction. The doctor too may conceivably gain some satisfaction from an increased turnover in an accelerated mass-service giving a large return of small profits. Can we as doctors delude ourselves that by following this banner of efficiency we shall attain happiness? The background and the training in our profession is towards the living of a good life, which is not necessarily the same thing as the making of a good living. Success, wealth and happiness may be complementary, but are certainly not synonymous. Success and happiness are not easy of definition—they are so much within oneself.

HAPPINESS

The Hebrew sage who defined the happy and successful man as the one who is satisfied with his portion was not far off the mark. The Hebraic roots for the words *happiness* and *riches* are identical. Happiness *is* wealth. It is interesting here to compare the Teutonic languages, where *luck* and *happiness* are kin (c.f. *geluk* and *gelukkig*) and also the English language (through the Latin *fortuna*) where luck and wealth are closely related.

Success in the profession, be it in the academic or the economic sphere, is but relative; it is not the amount of the achievement or the attainment, but the satisfaction with what has been achieved, that brings happiness. Is happiness easy of attainment by the practitioner of medicine? From all appearances, not so easy. Morbidity and mortality tables indicate that doctors are peculiarly prone to diseases associated with worry, and worry is hardly compatible with happiness.

Medical schools have been obliged by pressure on their resources to refuse admission to large numbers of applicants since the end of the war. Selection boards have the difficult task of trying to assess which applicants would make the best doctors. The candidates' measure of success in the matriculation examination was usually taken as the yardstick. How accurate this assessment is is questionable. Ought not something of the nature of an aptitude test to be substituted, not so much with the object of assessing how good a doctor a candidate will become, but how he will react to the stress and strain, the wear and tear, of a doctor's life with its working day of 24 hours, the possibility of the shabby coat and the wolf at the door? Some types cannot stand the strain and cannot avoid taking their worries with them onto the golf course at weekends and to bed at night. Good doctors they may be and usually are, but they succumb to worry in the end, usually before they have been able to make provision for their dependents.

Fortunate indeed is the doctor whose *hobby* is medicine; who has the means to make himself independent of the practice of medicine as his sole means of livelihood; who can, by restricting his practice, avoid the rush and the hurry which is part and parcel of general practice these days; who can afford to devote the time to the less scientific, the non-technical branch of his vocation—the art (as distinct from the science) of bringing with each visit a measure of comfort, confidence and peace of mind to a harassed patient, who may, somatically, not be desperately ill. Far be it from me to decry the well-deserved satisfaction of the skilled surgeon who has performed successfully some difficult and life-prolonging operation, who can look upon his 5-year survival rates with pride and pleasure. He is blessed. To few of us is given this ability and skill, or even the opportunity of acquiring it. But the practice of medicine is in the hands of a host of lesser mortals who must get satisfaction from their profession or they are doomed. It is small comfort to the doctor, or to his dependents, that his patient recovered, if the doctor himself is incapacitated by coronary disease. I repeat, without decrying the good work of the highly skilled specialist and the satisfaction he must obtain, that there is as great a satisfaction to be obtained by the ordinary G.P. from the confidence, the comfort and the peace of mind he can bring to his patients at almost every visit and from the esteem and affection which he himself gets from the patient and his family. To be appreciated, to be loved, is the secret desire of most of us. The role of Beloved Physician is fortunately within the reach of us all. The things I touched upon are personal to us as individuals. We are, however, not all alike. Some are better salesmen than their fellows; they can 'put themselves across', can create in their environment a demand for their services. Some relish the rush and turmoil of competitive practice, with the booby prize of 'Devil take the hindmost'. Others who are perhaps too vulnerable, cannot stand this strain, and seek their happiness in the less exciting, less spectacular and comparatively poorly paid full-time posts. But the number of these posts is too small to satisfy the demand of all those who are not getting the anticipated happiness from the practice of medicine. They need the help which it is in our power to give them collectively through our Medical Association, if not individually.

THE MEDICAL ASSOCIATION

Let us be realists and admit that ours *is* the Cinderella of the professions today—an unprepossessing wench, by the common consent of a laity intoxicated with good health and immaturity of judgment—a wench suitably occupied with the chores of preventing ill health among the masses and allowing a minimum of wastage through absenteeism in commerce, industry and the fighting services. But this wench can be transformed, as Cinderella was, into a most beautiful and desirable maiden whose smiles and favours are in great demand if the fairy queen waves her magic wand and gives to this same laity success, wealth and a more mature judgment; spiced perhaps with a spot of peptic ulceration or hypertension.

Let us admit without shame that the doctor has perforce to make a living out of his practice and refuse any longer to be mesmerised and exploited by the catch-phrases 'noble profession' and 'selfless servants of humanity' into undertaking *pro deo* or for a pittance the responsibilities of organized society towards the people. As individuals we are powerless, as a medical association we can acquire the power.

It should be our aim as the Medical Association of South Africa to protect our members against enslavement by this age of technology and mass production. The individual doctor-member must be the prime concern of our Association, which should be prepared to carry the fight against all the powers which try to enslave or exploit the doctor. It should excise the dry rot already present, by terminating all contract-practice agreements which are derogatory to the dignity of the profession or inimicable to the public. The Association has an important role to fill in helping us as doctors in our pursuit of happiness.

For how much longer is it prepared to stand aside and permit its members, through force of circumstances, to accept, for example, appointments as part-time Medical Officer of Health at salaries of £5-£10 a month, including the treatment of venereal disease? For how much longer is it prepared to accept capitation fees in contract practice as low as a tickey a week? What a scandal it is that a part-time district surgeon, if he gives good service, has to subsidize the Government by paying for the patients' medicine out of his already meagre salary—the drug allowance being totally inadequate for the purpose.

Can even the most loyal member deny that there is something lacking in the cordiality of feeling between the Association and the members? There is so very much that the Association can do if only

it realized its immense capability in this direction and if it had faith in the loyalty of its members. Surely it cannot have forgotten how steadfast this loyalty proved to be when put to the test not many years ago. In our panic recently we almost created a split in our own ranks by driving a wedge between G.P. and Specialist.

There is need, within the ranks of general practice, for the technologically trained practitioner, highly skilled in a limited sphere of medicine. The solution possibly lies in group practice, where these younger men with their highly specialized skills could serve the public well. They would remain on the general register, since the inclusion of their names in the register of specialists would automatically bar them from group practice, *but* they must have the right to charge such fees for their services as are commensurate with their specialized knowledge and ability. An additional register might be required, or even welcomed, to ensure that only those with the requisite training and skill would be permitted this privilege.

The Medical Association should emulate the Law Society in making membership obligatory and in collective protection of its members. I remember, during the very early 20's, the efforts of a certain financial group to corner the lucrative business of conveyancing and the administration of estates throughout the villages and towns of the Free State in competition with the established legal practices of attorneys. This was opposed by the Law Society and no attorney was permitted to take employment from this financial group. How different from medical practice, where hospitals, clinics, dispensaries and health centres employ doctors and compete freely with private practitioners.

I hope I have succeeded in awakening the conscience of those in whose hands we have placed our confidence, and the power to serve us well. We must reassure them once again of our loyalty, and also remind ourselves of the motto of our country—*Ex Unitate Vires*.

POLIOMYELITIS IN THE UNION

Following are the returns, supplied by the Union Department of Health, of cases notified under the Public Health Act as suffering from Poliomyelitis in the period 4 to 10 February 1955.

	European	*Non-European*
Transvaal		
Johannesburg	7	3
Pretoria	2	
Pretoria North	1	
Roodepoort-Maraisburg (1 fatal)	2	
Brakpan	2	
Pelgrimsrest		1
Pietersburg district		2
Nylstroom Municipality	1	
Whiteriver Village Council		1
Randfontein	1	
Germiston		1
Benoni	1	
Zeerust district	1	
Heidelberg	1	
Alberton		1
Total for Transvaal	19	9
Cape Province		
Cape Town Div. Council		6
Cape Town	1	1
Umzimkulu district		1
Matatiele district		2
Aberdeen	1	
Mount Currie Div. Council		1
Bizana Mag. District		1
Albany Div. Council	1	
Burgersdorp (ex Steynsburg)	1	
Total for Cape Province	4	12
Natal		
Durban		2
Amanzimtoti	1	
Pinetown district		1
Ndwedwe district		1
Nkandhlo district		1
Pietermaritzburg	2	
Malvern	1	
Hiltonroad		1
Greytown		1
Total for Natal	4	7
Orange Free State		
Vryburg		
Cyferfontein		11
Total for O.F.S.		2
TOTAL FOR THE UNION	**27**	**30**

Union Department of Health Bulletin. Report for the 7 days ended 10 February 1955:

Plague. Cape Province: One (1) Native case in the Uitenhage district. Diagnosis based on clinical grounds only. Laboratory confirmation is awaited. *Orange Free State:* No further cases have been reported from the Edenville area in the Kroonstad district since the notification of 6 January 1955, or from the Lindley district since the notifications of 13 January 1955; these areas are now regarded as free from infection.

Smallpox Nil.

Typhus Fever. Cape Province: One (1) Native case in the Vryburg district; diagnosis based on clinical grounds only. One (1) Native case in the Glen Grey district; diagnosis confirmed by laboratory tests.

Epidemic Diseases in other Countries:

Plague: Nil.

Cholera in Calcutta (India); Chittagong, Dacca (Pakistan).

Smallpox in Afghanistan Herat (Asia); Moulmein (Burma); Phnom-Penh (Cambodia); Allahabad, Bombay, Calcutta, Cochin, Delhi, Jodhpur, Kanpur Lucknow, Madras, Tellicherry (India); Kagoshima (Japan); Chittagong, Karachi, Lahore (Pakistan); Saigon-Cholon (Viet-Nam); Mogadiscio (Somalia); Tanga (Tanganyika).

Typhus Fever in Kabul (Asia).

NEW PREPARATIONS AND APPLIANCES : NUWE PREPARATE EN TOESTELLE

'*Seromycin*' (*Cycloserine, Lilly*). The Commercial Solvents Corporation (Terre Haute, Indiana, U.S.A.) and the Eli Lilly International Corporation (Indianapolis, Indiana) announce a new antibiotic 'Seromycin' (Cycloserine, Lilly) which has been discovered in the research laboratories of Commercial Solvents and subjected to a research project in cooperation with the Eli Lilly Company.

The product is not yet on the market. Further steps in this direction will depend on the results of further clinical work.

At the 14th Veterans Administration-Army-Navy Conference on the Chemotherapy of Tuberculosis, held in cooperation with the National Tuberculosis Association of the United States, Dr. Henry Welch, of the Food and Drug Administration, summarized personal communications from clinicians and gave results of FDA studies of blood and urine levels obtained with Seromycin. It was stated that 'impressive' improvement in severe cases of pulmonary tuberculosis and 'good' results in stubborn infections of the genito-urinary tract had been obtained in Atlanta, Georgia.

The Salk Poliomyelitis Vaccine.

Eli Lilly and Company announce that they have the production of poliomyelitis vaccine in full swing with the object of making it available shortly through regular pharmaceutical channels.

In 1950 the National Foundation for Infantile Vaccination of the United States invited the company to participate in the project of manufacturing the Salk vaccine in large quantities. As an emergency measure the company reconditioned and equipped a 5-storey building for the growing of virus in living kidney tissue from monkeys, and the preparation of the vaccine from it. This has involved the organizing of an adequate supply of Rhesus monkeys from India.

In the mass trial carried out last year in the United States 440,000 second-grade school children received poliomyelitis vaccine, and a similar number were injected with an inactive control. The rest of the total of 1,830,000 children who are participating in the scheme were observed in order to determine the natural history of the disease. The final report on the results of this trial is expected by 1 April 1955, when Dr. Thomas Francis, Jr., of the University of Michigan, hopes to complete the statistical and analytical work.

THE BENEVOLENT FUND: DIE LIEFDADIGHEIDSFONDS

The following contributions to the Benevolent Fund during December 1954 and January 1955 are gratefully acknowledged.

Votive Cards in Memory of:

Mrs. Amanda Hewson *by* Dr. Hellmuth Aneck-Hahn.
Dr. H. E. Brawn *by* Dr. J. W. Harris, Dr. L. E. Lane and Cape Midlands Branch.
Mrs. A. E. Leary *by* Dr. Aubrey Radford and Dr. L. Knox.
Comm. Surg. A. McDonnell *by* Dr. C. Mersky and Dr. I. Grayce.
Mr. P. Oram *by* Dr. and Mrs. W. Gilbert.
Dr. Reg. Meaker *by* Dr. L. Bass.
Mrs. Molly Baker *by* Dr. J. G. Louw.
Mrs. S. Blumberg *by* Dr. and Mrs. A. W. Sichel.
Mrs. Pres. Steyn *by* Dr. and Mrs. A. W. Sichel and Drs. R. Theron and Emilia Krause.
Annabel *by* Dr. and Mrs. A. Radford.

Total amount received from Votive Cards: £20 9 6

Services Rendered to:

Dr. H. van Schalkwyk *by* Drs. Jordaan, Verster, Marquard de Villiers and Venter.

Mr. A. Alper, father-in-law of Dr. B. Epstein *by* Dr. David Adler.
Dr. T. Shadick Higgins *by* Dr. A. W. Sichel.
Dr. M. Fouche *by* Dr. F. W. Roberts.
Dr. A. Goodman *by* Drs. E. Kaplan and Pieter Hafner.
Mrs. K. H. Dyke *by* Drs. Louw, McCabe and Navid of East London.

Total amount received from Services Rendered: £36 13 0

Donations:

Balance of monies collected as a result of the Annual Ball and Mannequin Parade by Southern Transvaal Branch	£41 15 2
Money left over after a birthday dinner given to Mr. MacGregor by his colleagues at the Hospital	11 5 0
Proceeds of the Antique Fair held in Conjunction with the Medical Congress in Port Elizabeth during 1954	123 1 3

Anonymous	8	0	0	Dr. E. H. Boodrie		10	6	Dr. C. C. Haupt		10	6
Dr. David McKenzie	3	3	0	Dr. J. Walker		10	6	Dr. N. C. Hopkins		10	6
D. J. L. van Selm	2	2	0	Dr. C. Ross		10	0	Dr. M. A. Lloyd		10	6
Anonymous	3	3	0	Dr. C. J. S. Wiese		8	0	Dr. N. M. L. Lund		10	6
Dr. S. A. Lange		10	0	Dr. R. McDonald	1	0	0	Dr. M. Minde		10	6
Dr. A. J. Ballantine	1	1	0	Dr. M. G. Woolff	1	1	0	Dr. J. D. Napier		10	6
Dr. G. C. Cruywagen		6	0	Dr. C. Ackerman		10	6	Dr. A. S. Nethercott		10	6
Dr. F. R. Luke		10	6	Dr. B. J. Brewitt		10	6	Dr. R. B. Peckham		10	6
Dr. H. F. Snyman		4	6	Dr. J. T. Braude		10	6	Dr. W. E. Birkenstock		10	6
Dr. E. Tucker	1	1	0	Dr. M. H. Campbell		10	6	Dr. M. T. S. Conradie		10	6
Dr. E. C. Greenfield	1	1	0	Dr. R. G. de Kock		10	6	Dr. T. H. Crouch		10	6
Dr. C. W. F. MacKay	1	1	0	Dr. S. S. Hoffmann		10	6	Dr. A. M. Dick		10	6
Dr. P. D. Nel	1	0	6	Dr. J. Joseph		10	6	Dr. B. N. Fraser		10	6
Dr. F. K. te Water Naude	1	1	0	Dr. H. A. Kalley		10	6	Dr. G. W. Huggins		10	6
Dr. M. Zabow		10	6	Dr. R. D. Kidd		10	6	Dr. P. J. Lewis		10	6
Dr. S. Sanders		10	6	Dr. J. Kleinman		10	6	Dr. R. Maller		10	6
Dr. A. W. S. Sichel		10	0	Dr. G. W. Moggridge		10	6	Dr. J. C. Schoeman		10	6
Dr. A. T. F. Maske	1	1	0	Dr. M. Maister		10	6	Dr. J. H. Symington		10	6
Dr. H. A. Hahn	1	1	0	Dr. C. A. V. Ovendale		10	6	Dr. H. W. van Zuidam		10	6
Dr. R. Glasser		16	6	Dr. F. L. Potter		10	6	Dr. S. P. M. Thomas		10	6
Dr. E. M. Chubb	1	1	0	Dr. J. F. Rivers-Moore		10	6	Dr. L. Feitelberg		10	6
Prof. E. C. Crichton		10	0	Dr. R. L. Tibbit		10	6	Dr. J. P. Beazley		10	6
Dr. R. L. Forsyth	1	1	0	Dr. S. Shapiro		10	6	Dr. J. S. Barnes		10	6
Dr. R. Burns	1	1	0	Dr. F. P. van Heerden		10	6	Dr. W. Blignaut		10	6
Dr. A. E. Pinniger		10	6	Dr. J. P. de Villiers		5	0	Dr. J. C. Clacey		10	6
Dr. J. K. de Kock		10	0	Dr. A. I. Goldberg		10	6	Dr. J. C. W. Ehlers		10	6
Dr. J. P. Immelman		11	0	Dr. Maurice Herman		10	6	Dr. A. C. L. Grantham		10	6
Dr. R. Resnekov	1	1	0	Dr. G. M. Malan	1	1	0	Dr. G. D. Hartley		10	6
Dr. L. N. Kaplan	5	5	0	Dr. C. P. J. Bester	1	1	0	Dr. A. Nel		10	6
Dr. H. Rompel		10	6	Dr. R. K. Beardmore		10	6	Dr. J. S. Norwell		10	6
Dr. W. C. J. Cooper		10	0	Dr. R. L. Baikie		10	6	Dr. W. R. Phillips		10	6
Dr. A. Smith	5	0	0	Dr. C. C. Brown		10	6	Dr. M. E. Schiele		10	6
Dr. G. L. Lambrecht		10	6	Dr. J. P. Grieve		10	6	Dr. K. Strauss		10	6
Dr. N. B. H. Veldsman		10	6	Dr. J. O. Harle		10	6	Dr. N. M. Thompson		10	6
Dr. A. R. Bain		10	6					Dr. R. T. Vaughan		10	6

Dr. N. A. A. van Buuren	10	6	Dr. B. L. Butler	1	1	0	Dr. C. P. Penberthy	1 1 0
Dr. R. A. Findlay	10	6	Dr. H. W. Needham	1	1	0	Dr. W. I. Robertson	10 6
Dr. L. G. McKenzie	10	6	Dr. F. T. Waldron		10	0	Dr. H. Carey Venis	8 0
Dr. C. M. Steed	1 0	0	Dr. A. E. Drotske	2	2	0	Dr. H. Katz	1 1 0
Dr. B. Krikler	10	0	Dr. L. A. M. Gama		10	6	*Total Amount received from Donations*	280 13 5
Dr. H. M. Fyvie	1 1	0	Dr. L. Tomory	1	1	0		
Dr. A. G. Sweetapple	1 1	0	Dr. E. Meltzer		10	6	Total	£337 15 11
Dr. H. O. Hofmeyr	6	0	Dr. F. E. Meltzer		10	6		
Dr. F. Krone	10	6	Dr. A. F. J. Jankowitz	1	0	0		
Dr. E. D. Morgan	1 1	0	Dr. E. G. Hestenes		10	6		

IN MEMORIAM

DR. JOHN ROBERT JARDINE

Dr. J. D. Joubert of Cape Town writes: It was a great shock to hear of the passing of Jock after a sudden acute illness at the comparatively youthful age of 45.

I regarded him as belonging to that type of general practitioner and family doctor whom we all admire and trust, and in whom the public has implicit faith.

Dr. J. R. Jardine

After practising as a dental mechanic in Bethulie for 10 years, he graduated M.B., Ch.B., at the University of Cape Town, and eventually settled in Elliot, where he and his colleague developed a very sound practice. Nothing was too much trouble for Jock, and if his patient was very sick, whether rich or poor, he would take him in his own car to hospital, sometimes over bad roads for 80 to 100 miles or more.

His investigations were always thorough, his opinion sound and his diagnosis usually correct. While applying his scientific skill and knowledge he was fortunate in being one of those who never lost the human touch, and he was therefore regarded by his patients as a well meaning friend, and someone whose advice they could certainly follow.

Jock was pleasant company; he was a brilliant conversationalist and he had the happy knack of including everybody present, young or old, in the conversation. He was a fine sportsman; he played a good game of golf and until quite recently played interprovincial hockey.

His patients will miss him, we his colleagues mourn his early departure, and to his wife and two children we extend our heartfelt sorrow and deepest sympathy.

The following is an extract of a notice that appeared in the Week End Mail (Elliot), bearing testimony to what Jock meant to his community:

With the passing of Dr. John Robert Jardine, not only his own family but the whole community of Elliot and district has suffered a great loss for he served this community with unstinted zeal and many times rushed to the bedsides of the sick when he himself was in bad health.

Dr. Jardine was born in the Barkly West district 45 years ago and spent his youth there and at Bethulie.

He worked for Dr. Rouche in Bethulie as dental mechanic for ten years during which period he saved in order to take up medicine. He studied at the University of the Orange Free State at Bloemfontein for two years and then proceeded to the Cape Town University where he qualified.

He then served under Dr. Fouche in Aliwal North until in 1944 he bought the practice of Dr. Pentz at Elliot where he spent 10 very fruitful and successful years.

In 1945 he married Miss Marie Vogel at Aliwal North.

During the ten years Dr. Jardine lived at Elliot, he took a very active part in all the different branches of sport....The doctor, who held 37 cups won at athletics, golf and tennis, first showed his aptitude for sport at University where he won his colours for hockey and athletics.

Dr. Jardine, as well as managing his own practice, was District Surgeon of Elliot and he also found time to take a great interest in building up the local hospital.

He had been ailing since his illness in Pretoria three years ago but his patients were always met with a smile and few realized how bravely he was fighting his own bad health.

Owing to a very fine gesture on the part of the Dutch Reformed Church who made their church available for the funeral as it was realized that the Methodist Church would be too small for the large crowd who wished to attend the service, to pay their last respects to a man who had served them so unstintingly, the service was held in the Dutch Reformed Church, the service being conducted by Rev. D. Young of the Methodist Church.

PASSING EVENTS : IN DIE VERBYGAAN

Dr. Peter V. Suckling, of Cape Town, has been awarded the degree of M.D., Lond., for his thesis *Malnutrition with Oedema in the Cape of Good Hope*.

* * *

Blood Transfusions. Doctors concerned are reminded that the Headquarters Bank of the Western Province Blood Transfusion Service at 57 Shortmarket Street, Cape Town (Tel.: 2-3174) is now open day and night and that, whilst emergencies will continue to take priority, blood can now be booked and set aside in the Bank for periods up to 24 hours at a time. It is pointed out that if this is done and the order is subsequently cancelled, no charge will be made; whereas, once the blood is sent out from Headquarters, it cannot be returned and a charge must therefore be made.

* * *

Bloedoortapping. Geneeshere word daaraan herinner dat die Hoofkwartierbank van die Westelike Provinsie-Bloedoortappingsdiens, Kortmarkstraat 57, Kaapstad (Tel.: 2-3174) nou dag en nag oop is en alhoewel noodgevalle nog steeds voorkeur sal geniet, bloed nou bespreek en vir tydperke van 24 uur in die bank opsy gesit kan word. Aandag word daarop gevestig dat indien sulke besprekings gekanselleer word geen gelde betaalbaar is nie, maar bloed wat alreeds afgelewer is kan nie teruggestuur word nie en betaling daarvoor moet geskied.

Dr. H. Klevansky, M.B., B.Ch. (Rand), M.R.C.P. (Edin.), has commenced practice as a dermatologist at 302 Sanlam Building, Strand Street, Port Elizabeth. Telephones: Consulting room: 2-8240; Residence: 2-8645.

Faculty of Medicine, University of Cape Town. The following paper is due to be read at Research Forum on 2 March 1955, at 12 noon, in the Large A-Floor Lecture Theatre, Groote Schuur Hospital, Cape Town. Speaker: Dr. E. N. Keen. Subject: *Aspects of the Growth of the Heart in Infancy.*

BOOK REVIEWS : BOEKRESENSIES

AIDS TO PRESCRIBING

The Hospitals Pharmacopoeia and Formulary, 1954. Provincial Administration of the Cape of Good Hope, 1954. Pp. 141. First edition.

There have been many selected lists of prescriptions used in certain hospitals and clinics in South Africa. Such 'formularies' have been prepared for the convenience of local pharmacists and prescribers. The recently qualified young doctor has often found difficulty at first in acquiring the art of prescription-writing and has sought a short-cut to easy 'ready-made' prescriptions.

The appearance in South Africa of the present volume, which follows very closely the National Formulary (1952) used widely in Great Britain, is an important and useful step forward. It will help to make prescribing and dispensing easier and more convenient for all concerned in hospitals controlled by the Cape Provincial Administration. Those in general practice will also find the book of value. It should form the basis of a National Formulary in this country and, with regular revision, the prescribing doctor will be kept up-to-date with advances made in drug therapy and pharmaceutical products.

Many official (B.P., B.P.C.) formulae appear in this formulary but many preparations and formulae have been included which have not yet been accepted in these official books; a certain number of formulae are included because of their traditional use. It is despairing that in spite of persistent recommendations that the Metric System be used the Imperial System is still used in many prescriptions; this is because it is still the practice among doctors in the Commonwealth to use the 'antiquated' system for older remedies and the Metric System for modern ones. The formulae are given in full English, not in Latin; this conforms with the request from the B.P. authorities. The formulary titles are, however, given in Latin with the English name as subtitle.

There is unfortunately no proper index of contents which would give a bird's-eye view of the book; there is, however, a very comprehensive general index. The contents of the formulary are arranged as follows. There is a list of preparations classified on a pharmacological basis according to the main systems of the body affected by particular drugs. The formulary proper which follows makes up the bulk of the book; it consists of a general section and then many sections with formulae used for special purposes and administered by different routes. At the back of the book are lists of proprietary or trade names, and the names of equivalent or identical drugs or preparations.

A few inaccuracies appear in the book, e.g. methadone is the approved name for amidone or physeptone (p. 107), and aminophylline is now official for the longer term theophylline with ethylenediamine. For pituitary (posterior lobe) injection which is no longer 'official' there are instead Injection of Oxytocin and Injection of Vasopressin; as a vasoconstrictor drug (p. 4) noradrenaline is better and will have to be included. Paraldehyde enema (p. 5) is in a wrong sub-group. The preface does not read smoothly and some of the points emphasized are not easy to follow.

The list of potentially harmful drugs referred to on p. 113 has already been much publicized, and readers of this *Journal* (11 December 1954) will have noted the regulations governing the use of these drugs, habit-forming drugs, and poisonous drugs.

The material is well and clearly set out in a book of pocket size, and has a useful feature in the blank opposite pages throughout the volume. An Afrikaans edition is being prepared; it is to be hoped that the nomenclature used will be practical and acceptable to all prescribers.

There is no question about the value and need of this book. It will become a 'standard' volume throughout the country, and every doctor should get his copy now, and the Afrikaans edition when it becomes available.

N.S.

TEXT-BOOK OF OPHTHALMOLOGY

Text-Book of Ophthalmology, Volume VI. Injuries. By Sir Stewart Duke-Elder, K.C.V.O., M.A., LL.D., D.Sc. (St. And.), Ph.D. (London), M.D., F.R.C.S., Hon. D.Sc. (Northwestern), M.D. (Dublin), D.M. (Utrecht, Strasbourg), F.R.C.S. (Edin.), F.A.C.S. (Pp. 6,912, with 1,145 illustrations. 105s.) London: Henry Kimpton. 1954.

Contents: Section 18; Injuries. 51. The Nature and Incidence of Ocular Injuries. 52. Concussion Injuries. 53. Wounds. 54. Retained Foreign Bodies. 55. Multiple Explosion and Gunshot Injuries. 56. The Indirect Effects of Mechanical Injuries. 57. Thermal Injuries. 58. Ultrasonic Injuries. 59. Electrical Injuries. 60. Radiational Injuries. 61. Chemical Injuries. 62. Stress Injuries. 63. Injuries.

Twenty-two years have elapsed since the first volume of Sir Stewart Duke-Elder's Text-book of Ophthalmology was published, and this year brings us the final two volumes, namely Volumes VI and VII. Ever since the first volume was published in 1932, ophthalmologists throughout the world have awaited almost with impatient anticipation the appearance of each succeeding volume, and as each has appeared they have marvelled at their comprehensive nature and the high standard that has been maintained throughout.

This book doubtless ranks as one of the greatest reference works of our time. When confronted with any new or unusual problem in ophthalmology it would be interesting to know what percentage of practising ophthalmologists refer in the first instance to 'Duke-Elder'.

Volume VI devotes all of its 1067 pages to the subject of Injuries. The text, the reproduction of diagrams, photographs and colour prints, and the bibliography are all up to the high standard we have been taught by former volumes to expect. In addition to covering familiar ground very thoroughly types of injury little known to the average ophthalmologist are included, such as ultrasonic injuries, atomic and radiational injuries, numerous chemical injuries sustained in modern industrial processes, agricultural injuries and stress injuries from raised and lowered barometric pressures, vibration and acceleration.

The chapters on Perforating Wounds and retained foreign bodies are particularly well done. Every type of localization of foreign bodies is referred to and illustrated. These chapters are among the very few in the complete text-book in which illustrations of operative procedure are to be found.

If one should criticize this and all former volumes, the first point is that the shiny surface of the paper causes light reflections sufficient to obscure the print unless great care is paid to the method of illuminating the page. This is a definite source of irritation which one feels could have been eliminated by selecting a different type of paper.

In a volume on injuries one might hope to find a chapter on their medico-legal aspects but this has been omitted. None the less one can be sure that this volume will be one of the standard books of reference in most medico-legal cases concerned with eye injuries.

The final Volume VII which is the smallest of the series, is printed on more readable paper and consists of two parts. Firstly there is an abbreviated Summary of Systemic Ophthalmology. This consists of short notes on sulphonamides, antibiotics and steroids which have come into use since the earlier volumes were written. Lists of infective and non-infective systemic diseases, central nervous diseases, diseases of unknown etiology and skin diseases are given with short notes on etiology, ocular manifestations and treatment of each.

The second part of this Volume VII is a general index of all the volumes. This is most useful as it enables one to look up references in a single index instead of delving into the index of each volume separately.

Comprehensive as these seven volumes are, the most noteworthy lack is an adequate volume on operative surgery. It was hoped by many that a volume on surgery would complete the series, but Sir Stewart has decided against this possibly because there have been

several excellent and comprehensive text-books on Ophthalmic Surgery in recent years.

Ophthalmology owes a tremendous debt of gratitude to Sir Stewart-Duke Elder and to all those first-rate workers who have assisted him in producing this monumental work. In the compass of seven Volumes the practising ophthalmologist has the equivalent of a reference library, which will stand him in good stead for most of the problems which confront him.

R.L.H.T.

PRACTICAL OBSTETRICS

Practical Obstetrics. By Bruce T. Mayes, M.V.O., M.B., B.S. (Sidney), F.R.C.S. (Edin.), F.R.A.C.S., F.R.C.O.G. (Pp. 500 + xiv, with illustrations. 87s. 6d.) London: Angus & Robertson, Ltd.

Contents: 1. Pre-Eclamptic Toxaemia. 2. Diagnosis and Management of Hypertension in Pregnancy. 3. Eclampsia. 4. A Summing-up: The Present-Day Management of Toxaemia of Pregnancy. 5. Hydatid Mole and Toxaemia of Pregnancy. 6. The Rh. Factor in Pregnancy. 7. Rubella and Pregnancy. 8. The Pregnant Diabetic. 9. Fibroids in Pregnancy, Labour, and the Puerperium. 10. Sterility: The First Consultation. 11. Sterility: Further Investigations. 12. Artificial Insemination. 13. Ante-Partum Haemorrhage. 14. The Long Labour and its Management. 15. Prolonged Labour, 'Disproportion' and 'Inertia'. 16. Breech Presentation and the Lovsett Technique. 17. Local Anaesthesia to the Pelvic Floor and Perineum. 18. The Occipito-Posterior. 19. Brow Presentation. 20. Prolapsed Cord. 21. Forceps Delivery. 22. Episiotomy: Complete Tear of the Perineum—Technique of Repair, and Nursing Care. 23. Induction of Labour. 24. Therapeutic Abortion: Hysterotomy: Sterilization. 25. Post-Partum Haemorrhage. 26. Traumatic Post-Partum Haemorrhage. 27. Acute Inversion of the Uterus. 28. Anuria. 29. Lower-Segment Caesarean Section. 30. Vaginal Delivery following Caesarean Section. 31. Abdominal Pregnancy. 32. Post-Maturity. 33. Infertility. 34. Supports in Pregnancy and Lactation. 35. Craniotomy or Caesarean Section. 36. Constriction Ring. 37. Post-Operative Intestinal Obstruction. 38. Consulting Room. Epilogue. Index.

This is an unusual text-book in which the author's knowledge and experience are clearly reflected. The presentation of actual cases illustrating obstetrical problems with discussion of the treatment is a most instructive way of clarifying these difficulties, while the reader should find the philosophical approach to obstetrical complications, and to the patient, most interesting.

Professor Mayes' description of toxaemia deserves special mention, particularly the discussion of the relative importance of the various clinical signs of this most perplexing condition. The author's understanding of human nature is obvious from his description of rest at home as compared with rest in hospital.

The chapter on the pregnant diabetic deals with hormonal as well as the conventional treatment, while the necessity for specialists in the different branches of medicine to work together is also emphasized. Mention is made too of the danger of rupturing the membranes during the induction of labour in cases of intra-uterine foetal death.

The treatment of brow presentation is simple, according to the author, namely Caesarean section. Some authorities may consider this too radical; as far as the rest of the book is concerned, however, the more conservative school of thought is followed.

The literary style of this 'companion' and its conciseness make for easy reading. Those interested in refreshing their knowledge of obstetrics can do no better than to read this volume once or twice.

J.B.N.

RHEUMATIC DISEASES

Rheumatic Diseases: Diagnosis and Treatment. By Eugene F. Traut, M.D., F.A.C.P. (Pp. 942 + xvi, with 192 illustrations. £8 10s. 0d.) St. Louis: C. V. Mosby Company. 1952.

Contents: 1. Etiology, Classification and Pathogenesis of Diseases of Joints. 2. The Nervous System and Rheumatic Diseases. 3. Psychologic Factors in Rheumatoid Arthritis. 4. Joints and Periarticular Tissues in Immobilized Extremities. 5. Focal Infection. 6. Pathology of Joint Disease. 7. Histopathology of Muscle in Rheumatoid Arthritis and Other Diseases. 8. The Collagen Diseases. 9. Symptoms, Findings and Diagnosis of Joint Disease. 10. Rheumatic Pains in Children. 11. Juvenile Rheumatoid Arthritis (Still's Disease). 12. The Skin in Rheumatism. 13. The Ocular Manifestations of Rheumatic Diseases. 14. Gout. 15. Tuberculous Arthritis (Tuberculosis of Bones and Joints). 16. Fibrositis. 17. Rheumatic Fever. 18. Endocarditis. 19. Rheumatic Diseases Affecting the Feet. 20. Rheumatic Diseases of the Back. 21. Osteoporosis. 22. Disorders of the Intervertebral Disks. 23. Sciatica. 24. Pain About the Shoulder. 25. Disability of the Upper Extremities in Coronary Disease (Shoulder-Hand Syndrome). 26. Psychogenic Rheumatism. 27. Lupus Erythematosus Disseminatus. 28. Scleroderma. 29. Periarteritis Nodosa (Polyarteritis Nodosa, Necrotizing Arteritis, Panarteritis). 30. Dermatomyositis. 31. Psoriasis and Arthritis. 32. Reiter's Disease. 33. Hemorrhagic Arthropathies. 34. Hypertrophic Pulmonary Osteoarthropathy (Clubbed Fingers, Hippocratic Fingers, Marie-Bamberger's Disease). 35. Abnormal Calcification in Skeletal Disease. 36. Prognosis of Joint Disease. 37. Treatment of Joint Disease (General). 38. Medicinal Treatment of Chronic, Nonspecific Arthritis. 39. The Relation of the Endocrine Glands to Rheumatic Diseases. 40. Food in Arthritis. 41. Vitamins in the Treatment of Arthritis. 42. Physical Medicine in the Treatment of Arthritis. 43. Manipulation. 44. Occupational Therapy. 45. Roentgen Therapy of Arthritis 46. Vaccines in Treatment of Arthritis. 47. Gold and Other Heavy Metals in Arthritis. 48. Prevention of Deformities in Joint Disease. 49. Surgical Treatment of Arthritis. 50. An Outline of the Approach to Treatment of Chronic Joint Disease of Unknown Origin. 51. Compensation (Legal) Features of Rheumatism —Its Industrial, Insurance and Military Aspects. Index.

There are not many well-known books available which deal comprehensively with the rheumatic diseases, so that a newcomer to the field does have a place. The chapters are all compiled by the author himself, though acknowledgement is made to various collaborators, with the result that one is offered the considered opinion on all aspects of rheumatology by an author with wide experience and interest in this field. The book has rightly omitted theories and therapies considered outmoded, and avoids the error of uncritical enthusiasm for the newer endocrine therapy in the arthritides. It is well worth reading by the general physician, the rheumatologist, and the student.

M.H.

FUNDAMENTALS OF ANAESTHESIA

A.M.A. Fundamentals of Anesthesia. Prepared under the Editorial Direction of the Consultant Committee for Revision of Fundamentals of Anesthesia, a publication of the Council on Pharmacy and Chemistry of the American Medical Association. Third Edition. (Pp 279 + xvi with illustrations). Philadelphia and London: W. B. Saunders & Company. 1954.

Contents: 1. Physiology of Respiration. 2. Chemistry and Physics. 3. Preoperative Care. 4. General Anesthesia. 5. Regional (Conduction) Anesthesia. 6. Special Applications. 7. Postoperative Care. 8. Complications. 9. Miscellaneous Considerations: Important Concepts for Inhalation Therapy. 10. Records. Appendix. Index.

The third edition of this very excellent book is of a standard that is only to be expected of such a distinguished panel of authors. The first two editions were published during World War II as a manual of instruction in anaesthesia for medical officers. It served this purpose so well that it has now become a text-book of instruction in the basic principles of anaesthesia for medical students, interns and registrars. The presentation of the subject matter is clear and precise, and allows a rapid revision of those fundamentals which are so necessary to anyone who wishes to give safe anaesthetics. With the increasing complexity of modern anaesthesia a thorough knowledge of the physiology of respiration is essential, and this has been very well covered. The chapter on regional anaesthesia is excellent. The relaxants, however, have not been very adequately dealt with, and the dangers of thiopentone might have been more forcibly stressed. The widespread use of relaxants in this country by the occasional anaesthetist must lead to a large number of deaths. A large proportion of these could be avoided if the very real dangers of these drugs were more widely understood.

The importance of a clear air-way and adequate oxygenation of the patient is well illustrated with diagrams. This book can be thoroughly recommended to anyone who may be called upon to administer anaesthetics.

P.R.M.

BOOKS RECEIVED : BOEKE ONTVANG

Ciba Foundation Symposium on Chemistry and Biology of Pteridines. Edited by G. E. W. Wolstenholme, O.B.E., M.A., M.B., B.Ch., and Margaret P. Cameron, M.A., A.B.L.S. (Pp. 425 + xiv with 143 illustrations and diagrams. 42s.) London: J. & A. Churchill Ltd. 1954.

Die Ursachen der Kinderlähmung und verwandter Krankheitszustände. By Dr. E. R. Elste. (Pp. 148.) Emmendingen: Senior Verlag. 1954.

The Nuffield Foundation—Report on grants made during the ten years April 1943 *to March* 1953. (Pp. 319.) Oxford: The University Press. 1954.

The Nuffield Foundation—Report for the year ended 31 March 1954. (Pp. 141.) Oxford: The University Press.

Ontwikkeling en Vernieuwing van de Sociale Kinderhygiëne. By Suze M. C. Van Veen. (Pp. 122.) Assen: Van Gorcum and Comp. N.V. 1954.

De Sociale Kinderhygiëne in Nederland. By Dr. J. T. Buma. (Pp. 105.) Assen: Van Gorcum and Comp. N.V. 1954.

Modern Trends in Ophthalmology. Edited by Arnold Sorsby. Third Series. (Pp. 346 + xiv with 111 illustrations.) London: Butterworth and Co. (Publishers), Ltd. 1955.

Amphetamine in Clinical Medicine—Actions and Uses. By W. R. Bett, M.R.C.S., L.R.C.P., F.R.S.L., Leonard H. Howells, B.Sc., M.D., F.R.C.P. and A. D. Macdonald, M.A., M.D., M.Sc. (Pp. 78. 7s. 6d.) Edinburgh and London: E. & S. Livingstone Ltd. 1955.

The Year Book of Drug Therapy (1954—1955 *Year Book Series*). Edited by Harry Beckman, M.D. (Pp. 592 with 74 illustrations. $6.00.) Chicago: The Year Book Publishers, Inc. 1955.

Manual of Hand Injuries. By H. Minor Nichols, M.D. (Pp. 352 with 180 illustrations. $9.50.) Chicago: The Year Book Publishers, Inc. 1955.

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CORRESPONDENCE : BRIEWERUBRIEK

TRAINING IN GENERAL PRACTICE

To the Editor: Professor Guy Elliott [1] gives an interesting review of the tendencies in general medical education, a review that should provoke considerable discussion before any one of the suggested schemes, or its modification, is adopted in this country.

My main criticism would be that we do not start off with a generally accepted objective. What type of general practitioner do we wish to produce? Is the harrassed Reef G.P.—who, through no fault of his own, sees, but scarcely examines, enormous numbers of patients daily—to be the standard? Or are we to accept the training in the Alexandra Health Centre, where, in the first place, the language difficulty is an absolute bar to the older practitioner-patient relationship? Surely the older country doctor, trusted and tried by his community and unhampered by benefit societies, should be a more acceptable standard.

The Norway scheme would seem to be more suitable. At the completion of his course and after 6 months in hospital, the student would be freer to take full advantage of the opportunities offered. And furthermore, it seems to answer the criticism submitted in that, in a period of 6 months, the young medico would be given more and more responsibility and would certainly become more familiar with his patients.

Observer

10 February 1955

1. Elliott, G. A. (1955): S. Afr. Med. J., **29**, 134 (5 February).

REVERSED PATENT DUCTUS ARTERIOSUS

To the Editor: With reference to Dr. Greenstein's article on Phonocardiography,[1] I was interested to hear of his experience with cases of Reversed Patent Ductus. A moderate pulmonary hypertension is not uncommonly found in patent ductus. The severe degree, exceeding the systemic pressure, present in these other cases makes one wonder whether it is not the pulmonary hypertension that is primary, and the ductus secondary, acting as a safety-valve.

Evidence that this may be so is suggested by the fact that some cases have had cyanosis of the lower extremities since early childhood. If the pulmonary hypertension were a secondary effect, one would not expect such a severe degree so early in life. At operation in these cases compressing the ductus manually raises the pressure in the pulmonary artery still higher, and consequently ligation is contra-indicated. Apparently Mr. Adler's case was better clinically after ligation, but I should be interested to know the pre-operative and post-operative pulmonary pressure readings.

J. J. H. Rymer

P.O. Bag 1020
Pietermaritzburg
14 February 1955

1. Greenstein, J. (1955): S. Afr. Med. J., **29**, 123 (5 February).

RIVISTA DELLA TUBERCOLOSI

Some days ago I received from the management of the *South African Medical Journal* copy of a review published on 2 January 1954 regarding the *Rivista della Tubercolosi e delle Malattie dell'Apparato Respiratorio*, conducted by myself. The review is signed O.E.B-O. and I do not know the author's name.

In my opinion, the contents and form of the review are not very correct in respect of the Forlanini Institute in Rome and myself as its manager. Complaining of the inflation of medical journals in the world (to which we could agree), the author does not judge too kindly the articles of No.1 of the *Rivista* and the worth of the journal; such appreciations, of course, cannot be accepted by me. Evidently your colleague has no knowledge of the Italian language —which should be necessary before writing a critical review—nor is he technically competent to judge the intrinsic value of some articles contained in the review—as he admits himself in connection with the third article.

I do not think that the Forlanini Institute, which is well known in the scientific world, and a journal which is the scientific emanation of the University Phthisiological in Rome, deserves a judgment given so lightly and superficially. It is only to be remembered that over 500 foreign physicians have come to Rome during the last 20 years in order to get at Forlanini's a thorough knowledge of tuberculosis, and that a great number of worthy colleagues from South Africa granted us the privilege of their visits.

Prof. A. Omodel Zorini.

Instituto Nazionale della Previdenza Sociale
Ospedale Sanatoriale 'C. Forlanini'
Rome
10 January 1955

HOSPITAL FACILITIES IN THE FEDERATION OF RHODESIA AND NYASALAND

The Secretary of the Medical Association of South Africa has received the following letter:

Dear Sir: I should be grateful if all medical practitioners, who may contemplate coming to Southern Rhodesia, may be warned that, whilst up to the immediate past all medical practitioners had the privilege of admitting and treating their patients in Government Hospitals, this privilege may be drastically curtailed in the future, and that all newly-arrived practitioners may have their applications considered by a Committee appointed for this purpose. There is no such privilege in Nyasaland, and the position in Government hospitals in Northern Rhodesia will also be under review in the near future.

The Memorandum on Practice in Southern Rhodesia, published by this Association, will be amended.

P. H. Shorthouse
Hon. Secretary

Medical Association of Southern Rhodesia
(British Medical Association)
Box 596
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9 February 1955